unity

Curricular Framework

Activities & Resources

A collection of classroom exercises to be used alongside the Unity Curricular Framework

Activities and Resources

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Introduction to Game Design

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Intro to Game Design and Analysis

Game Analysis Activity

Have students choose a game they're familiar with. Ask them to answer the following questions:

- Who is the protagonist?
- Who is the antagonist?
- What is the game objective?

- What obstacles keep the player from achieving that objective?
- When does the game get easier?
- When does the game get harder?
- How does the game make you feel?

Lead a discussion about how these various factors combine to build a powerful game experience. Touch on issues about narrative and narrative choice, (i.e. how the story influences the game play) game balance, (i.e. when does the game feel fair or unfair,) and mechanics design (i.e. how do the players' actions change the game state.)

Game Modification Activity

Have learners download Candy Crush Saga onto any game play device. The game can be found by googling for "play candy crush free."

Have them play the game long enough to understand the directions and the overall objective(s) of the game.

Have them produce a *Game Modification Task Sheet* document by identifying the following:

- What platform is used to play the game?
- What is the objective of the game?
- What three things do you like about the game?
- What three things did you not like about the game?
- List three reasons why you think this game is popular and successful.

Based on their own observations, have them create a written plan for modifying the game. This document will serve as your *Game Modification Plan*.

Your plan should include the following:

- Re-write the main goal of the game.
- Describe how you would improve the game. Be as specific as possible!
- List three reasons why your ideas may not have been implemented by the original designers.
- List three reasons why you think players would like your changes.
- List three reasons why these changes would be difficult to implement.

Intro to Game Design Documents

Game Design Brainstorm Activity

Have learners begin a new document called the *Prototype Game Design Document.* Within this document, have them start a section called *Prototype Ideas,* and have them enter at least five core game (i.e. product) ideas to be considered for their final *Capstone Project*. These do not need to be very detailed ideas, just a few sentences to capture the main game concept. Later, one of these ideas will be developed and delivered as their final *Capstone Project* submission.

Intro to the Unity Editor

Exploring the Unity Editor Activity

This activity will allow learners to get acquainted with the Unity Editor, which will be the primary tool used for the creation of the *Capstone Project*. This exercise will also introduce them to importing assets, the viewer windows, and how to navigate within the Unity Editor. Although this is a brief exploration of the Unity Editor, it will set the stage for the development work the learners will produce throughout the course.

- The Unity Project "Getting Started With Unity" takes students through the process of setting up their Unity environment, as well as teaching them basic commands and navigation through the editor. Lead learners through the first two modules in the project, "Create Your First Project" and "Beginner In-Editor Tutorials".

Critical Thinking in Game Design

Activities and Resources

Critical Thinking in Games

Design Analysis Assignment

Choose a game. Play on your own, if the mechanics allow it. If the game only supports multiplayer modes, play with one or more of your peers. Play as a *designer*, paying attention to the mechanics, dynamics, and

aesthetics as described in the Mechanics-Dynamics-Aesthetics (MDA) framework. If you are unfamiliar with the MDA framework, search for it online and familiarize yourself with it prior to performing this step.

Reflect on your play experience.

- What were the game's apparent design goals? Did it succeed at those goals? Why or why not?

- What were the mechanics? What was the play experience? What is the relationship between the two? Did you find any strategies that were exploitable? Did the game seem well-balanced?

- What kinds of interesting decisions (and uninteresting ones) were you making throughout the game? What do you feel was the competitive differential of the game?

Write your analysis of the game within a new *Game Modification Task Sheet*.

Include the following information:

- Name of the game and its publisher (this will help get you in the habit of giving credit where due. It will also ensure everyone references the same game).

- Describe the core mechanics of the game. You do not have to reproduce the rules, but you should describe the basic play of the game and the main decisions players are making. Assume your audience has never played the game before!

- Include the Mechanics-Dynamics-Aesthetics (MDA) of the game, showing how they emerge from the mechanics (if you are not sure, provide a guess).

- State the game's design goals. Indicate what the designer was trying to do! Then, indicate whether you feel the game met those goals, explaining why or why not.

- Note anything else you can about the game (such as a particular issue with game balance or a unique use of game components).

- Lastly, if you were the designer, what would you change about the game (if anything)? Make specific recommendations for your suggested changes. For example, do not just say "I would make the game more interactive between players" or "I would fix the problem that I identified earlier" – say *how* you would fix things. What rules would change and what would they change to? Would you change any game objects or values?

- Remember, your audience is made up of other game designers. Write your analysis so that other designers can learn from the mistakes and successes of the game you chose. Your goal is to educate and inform them about the game you selected. Another goal is to discover new lessons about what makes games work or not work. These goals are more important than a review score!

Critical Thinking Assignment

Do you agree or disagree with the following statement? Explain your response.

"Not only do we tend to think about the world according to what we want to see and what we need to see, we tend to think in terms of what we expect to see."

One Button Game Assignment

You work for a hard-core gaming company called Cheap Fun Games, Inc. The sole purpose of the company is to make money by creating simple and addicting games. These games are intended for people who love to play computer/video games, but simply do not have the time and money to do so. Your management team likes to keep work exciting, so they have decided to create a competition. The winner of the

competition receives a fully paid vacation to Hawaii. Every game designer, within the company, now strives to design the next big one-button game. The best design wins.

To win the grand trip, you must design the winning game. This game is to be played on multiple platforms. Your game can only have one button as the main interaction, displayed on the screen during gameplay along with all game graphics. By definition, a button has three states: pressed, held, and released. The button must be stationary on the hardware or screen. No control pad, no voice, touch gesture, or accelerometer allowed.

Write a game proposal for your best idea, being sure to include all relevant design information.

1. Game Title
2. Game Genre
3. Overview: The basics of the game
4. Player Rule
5. Gameplay Mode
6. Settings
7. Challenges
8. Core Features in the Game: Clearly describe each feature and explain why it is important
9. Game Mechanics
    i. Game Function Rules
    ii. Actions (i.e., what does the player need to do to tackle the challenges)
    iii. Define the lives, ammo, money, health points, etc., in the game
    iv. Explain how are they produced or obtained?
10. Game Balance:
    i. Reward and punishment
    ii. Levels of difficulty
11. Victory Conditions:
    i. How do you win the game? If there is no way to win the game, what is the player trying to accomplish?
    ii. How do you lose the game? (if applicable)

Game Design Document Development

Brainstorm Development

Within your *Prototype Game Design Document*, flesh out the basic ideas you brainstormed. You can use text or images, whichever you like better. Which ideas seem particularly good? Why? Add at least two or three sentences or images to each idea, so that you and your audience have a better understanding of your game concept.

At this point, you should focus on producing a rough outline, illustrating only a few key ideas. You will continue to refine your decision and add detail to your concept as the learning progresses.

Basic Unity Functionality

Implement a Microgame

At this point, learners have opened the Unity Editor and should be familiar with the user interface. This unit will allow them to experiment with importing and manipulating game objects.

Lead learners through the "Welcome to the Creative Mods" and the "Platformer Microgame" tutorials. Make sure that each learner has downloaded and imported the Platformer Microgame assets.

Additional Suggested Resources for Unit 2

Which books, digital resources, & other materials will be used in this lesson? Listed below is a recommendation of resources to consider for this unit:

- [Useful to help learners understand and perform critical thinking](#)
- [Critical Thinking PowerPoint](#)
- [The Six-Step Problem-Solving Process](#)

Game Design Theory

Activities and Resources

Unity Skill Building and Reinforcement

Implementing a New Microgame Activity

As learners become familiar with designing and planning games, they will need to understand and apply the game creation tools found in the Unity Editor. The following tutorial will allow learners to develop a deeper understanding of how to implement and manipulate game assets in the Unity Editor. It will also help learners to continue applying game development knowledge and skills from previous tutorials. Finally, the skills learned in this tutorial are essential for ongoing professional development and learners should apply these skills to their *Capstone Project*.

Once learners have gotten comfortable with the "Platformer Microgame," have them import the assets for the "FPS Microgame" and run through some of the modification tutorials. The basic changes to the game will be similar, and students will be able to see how different games can be modified in similar ways.

Game Design Document Development

Game Design Document Outline Assignment

In your *Game Design Document (GDD),* create drafts of *Section 1: Concept Document* through *Section 1.4: Game Analysis*. You do not need to complete the *Game Reference, Game Technical, or Game Sales* sections at this time.

Pick your favorite idea from the top three you brainstormed during your mind-mapping assignment. You may change your mind, if later you desire to develop a different idea instead.

In your *Game Design Document (GDD)*, write down key strategic considerations for your game. Address the following questions:

- In what genre is the game?
- What type of game will this be?
- What kinds of puzzles or player challenges might you include?
- What are the basic rules for your game?

Put some serious thought into these questions, as they will guide your development as the course progresses. The more time you spend now, the easier your final project will be!

Project Management for the Game Developer Activity

Understanding and applying project management is an essential skill for a game development professional. This activity will introduce the learner to basic concepts of managing a project, within the context of game development and through management of the *Capstone Project*. For this activity, the learners should complete a basic project charter using the supplied *Project Charter Form (PCF)*.

Intermediate Game Analysis

Student Led Game Analysis Assignment

Document the primary/operational rules of a reasonably simple game that you like. Include a sketch of the user interface; a list of all the buttons and menu items; and a list of the other modes that may be available. Describe the challenges and actions that make the game interesting to you.

Discuss the goals and objectives of this game. What genre(s) would you classify this game and why? Describe the game mechanics. How intuitive (i.e. easy) is it to navigate the game? Explain the constitutive rules and the implicit rules. What is the player motivation? How does the challenge compare to the risks and rewards? Explain why you think this is or is not a balanced game.

Certain genres are found more frequently built using one kind of environment (i.e. 2D top-down or 3D ground-up) than another. Write a short paper explaining which game environment each genre typically works best on and why. Try to answer the following question: how do the environment's features (e.g. graphic style, mechanics, player controls) and the way that it is used facilitate or hinder the gameplay in each genre?

Genre Exploration Assignment

Play three games and answer the following:

1. What is the genre? Is there a specific sub-genre? Could the game belong to more than one genre? Be sure to provide information that helps validate your choice.

2. Who is the audience?

3. What are the goals and objectives?

4. What is the overall narrative? (Explain in two or three sentences)

5. How would you describe the overall game? (i.e., look, playability, and entertainment)

Prototype Game Assignment

Think of an idea you have for a game and answer the following questions:

1. What is the general flavor of the game? You can make references to other games, movies, books, or any other media if your game contains similar characters, actions, or ideas.

2. What is the player's role? Is the player pretending to be someone or something, and if so, what? Is there more than one? How does the player's role help to define the gameplay?

3. Does the game have an avatar or other key character? Describe him/her/them.

4. What is the nature of the gameplay, in general terms? What kinds of challenges will the player face? What kinds of actions will the player take to overcome them?

5. Does the game fall into an existing genre? If so, which one?

6. Why would someone want to play this game? Who is the game's target audience?

7. What is the game's setting? Where does it take place?

8. Will the game be broken into levels? What might be the victory condition for a typical level?

9. Does the game have a narrative or story as it goes along? Summarize the plot in a sentence or two.

Rules on Three Levels Exercise

This formal design exercise works best with groups of three learners. Ask the learners to think of a game that could be played in the classroom. The first person, out of the group of three, is asked to secretly write down two game rules for the game they are thinking about. Each rule is to be written on a separate line of the paper, so that when the top rule is covered up, the second rule remains visible. The next person looks at the second rule and then adds two more rules onto the list, leaving the last rule visible for the final person to view. The final person writes down one final rule and then adds a winning condition. All of the rules are then revealed and the group fashions a game out of the total set of rules. The goal of the exercise is to see how rules interact with each other within the system of a game. Learners also explore the limits of ambiguity and specificity in rules by conducting the exercise. If there are more people in each group, learners should each write down a single rule, to keep the rule-set from becoming too complex.
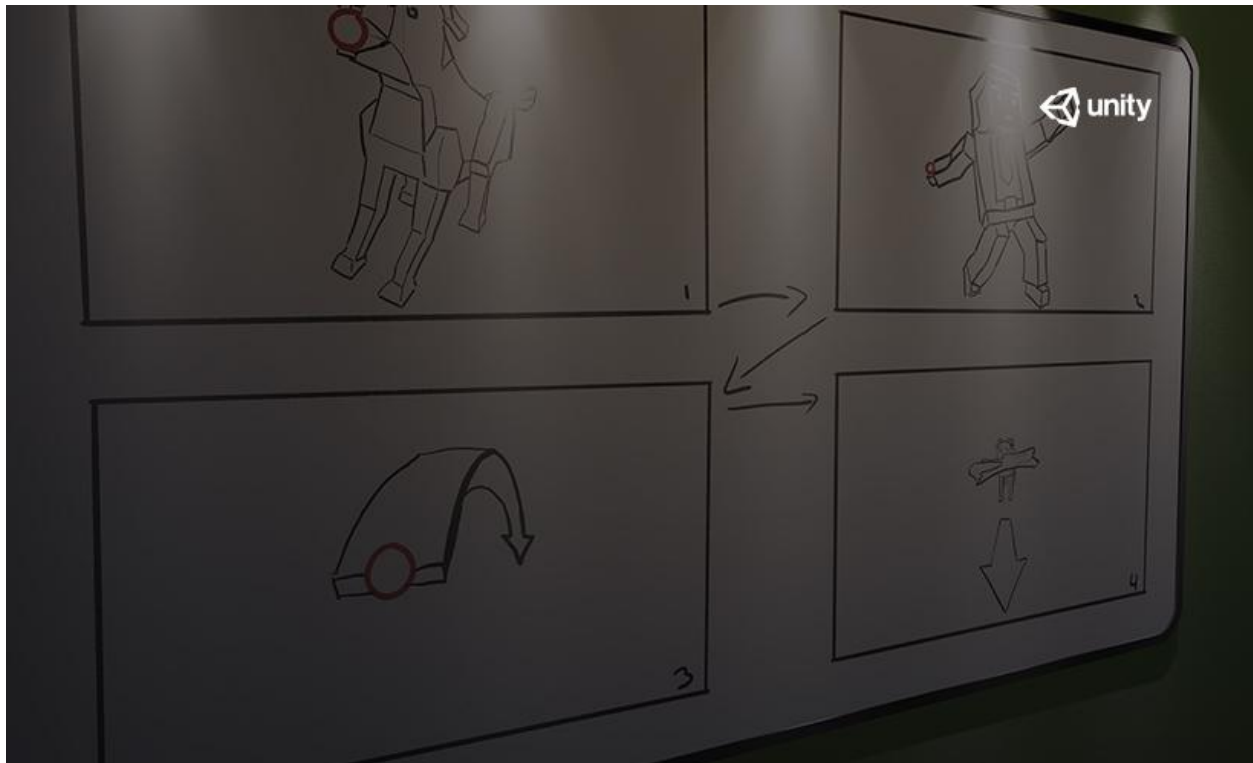
Story and Game Creation

Activities and Resources

Stories in Games

Group Story Generation Activity

Divide the class into groups of three learners each. Within the small groups, each person is assigned a number (one, two, or three). Each group is given a sheet of paper and asked to write the words "Once Upon A Time…" at the top. Next, write the word "Who?" on the board for the class to see. Instruct the first person from each group (number one's) to write one or two sentences, describing *who* was going to be in the story. Tell them that they only have two minutes to write their notes, encouraging them to write adjectives and have fun with it. Next, write the word "Where?" on the board for the class to see. The second person from each group than has two minutes to write *where* the story takes place. Continue the process until all of the following questions are addressed on the sheet of paper:

- When?

- What is the problem?
- Who said What?
    - *Let the learners know that someone in the story has to say something, so that learners have an opportunity to reinforce quotation marks.*
- Who said What back to that person?
- Something bad happens
- Something good happens
- Something funny happens
- How it ends

Direct the learners to work together to convert their sentences into a storyboard with illustrations. Next, using a 'round-robin' type of routine, ask each group to share their story with the class.

Game Design Document (GDD) Storyboard Assignment

In your *Game Design Document (GDD)*, create a storyboard for your game idea. This is still a pretty high level storyboard, so you do not need all the nitty-gritty details but at least a storyboard of the major story components. Jot down a few paragraphs of narrative that introduce your storyline. Introduce the back-story. What happened just before the action in the game – how did the main character end up in the situation they are placed at the beginning of the game? If your game does not have an actual storyline, jot down the background for how you developed the idea for your game. What was in your mind? Why do you think your idea is a good one? What was your inspiration? Remember your game will have a storyboard even if you are not developing a narrative type game.

In your *Game Design Document (GDD)*, provide details on the main characters and any supporting characters for your *Capstone Project*.

- Write out the physical features of the character, using five bullet points.

- Using the provided Character traits list, identify two dominant traits for your main character. Include an explanation of the character's development of those traits.

- In paragraph form, create a back story for the character. The back story must lead the character up to a point of current conflict, but does not need to include their current conflict. In paragraph form, write out emotional/personality of the character.

Create a draft for sections *1.5-Game Atmosphere, 1.6-Game Play,* and *2.6-The Story* in your *Game Design Document (GDD)*. You will revisit and revise these sections as you learn more throughout the course.

Character Creation Exercise

Students will create three characters, complete with backstories, connections, and motivations. Starting with the story outlines students completed in this chapter, have students diagram the following for three characters: the protagonist, the antagonist, and a third character.

- Place of Birth
- Family
- Favorite Person
- Most Important Event Before the Game Starts
- Deepest Desire
- Archetype

Have a class discussion about what makes interesting characters, touching on complex motivations, frustrated desires, and fatal flaws.

Project Management

Work Breakdown Structure (WBS) Exercise

In the last unit, learners were introduced to a basic project charter. In this unit, they will learn how to manage resources (i.e. time and talent) to accurately predict how long a project will take. They will also create a roadmap, which details the steps they need to take in order to meet the milestones to keep the project on track. The *Work Breakdown Structure (WBS)* document will be used to itemize specific tasks to be completed in order to finish a project. This can include very high level tasks as well as very detailed and highly specific tasks. For this part of the project, just enough project management is recommended and learners will only create a WBS for the higher level tasks. They will complete the WBS by listing the higher level tasks to be completed on the *Capstone Project*. This can be changed and edited as new knowledge and understanding of the process occurs.

Terrain in Unity

Terrain Activity

Students should follow the [basic terrain tutorial in Unity Learn, here](#). When students have finished the tutorial, ask them to create one of the following:

- A rocky cliff
- A sandy beach (without water)
- A canyon road
- Rolling hillsides

Have students share out their creations and talk about how to make terrain look believable and interesting. Issues of scale and resolution are important here, as well as the concept of giving players sightlines to understand their environment.

Other Suggested Resources

- [List of character Archetypes](#)
- [Storyboard Handout](#)
- [Storytelling in Games video](#)
- [Use Twine to make a simple branching narrative](#)
- [Environmental Storytelling](#)
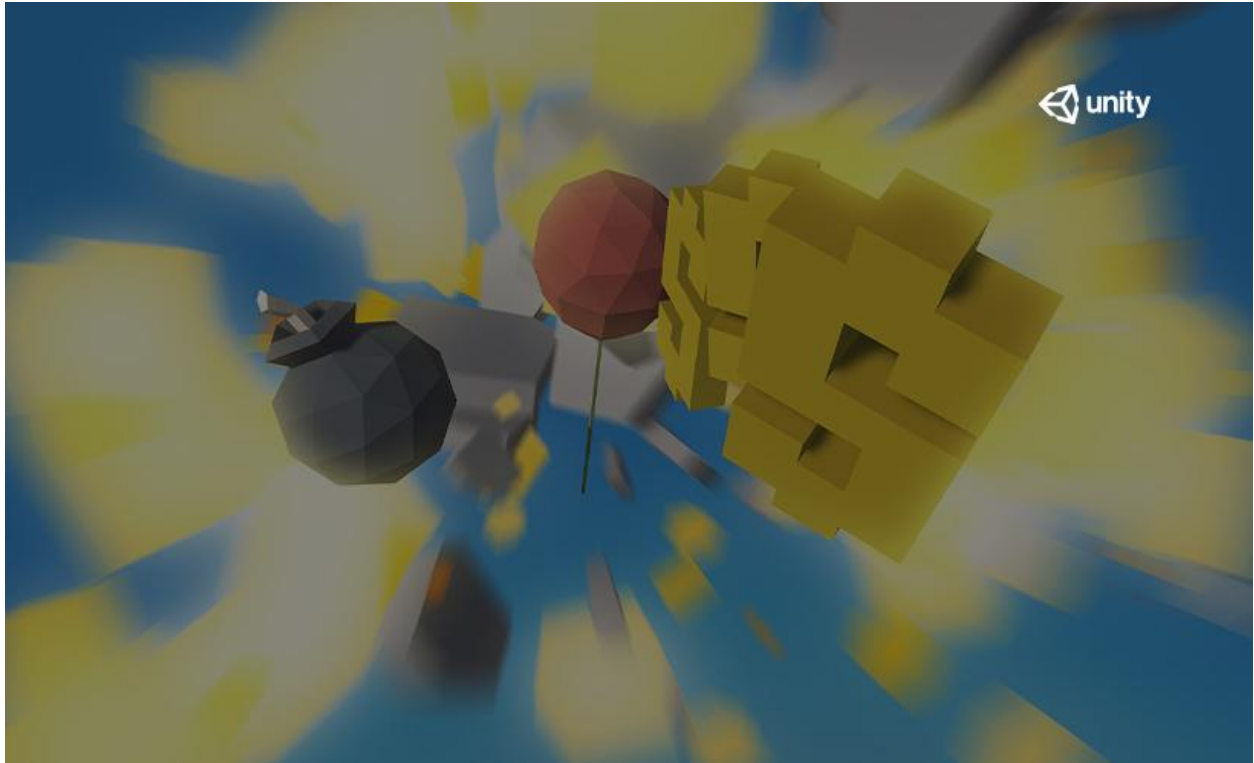
System Dynamics and Scripting Fundamentals

Activities and Resources

Scripting Fundamentals

Building Learner Scripting Skills - Assignment

This tutorial section covers some basic ways to use Unity to put game objects together. By this Unit, learners should have experience in the import and setup of objects/models in the Unity Editor (See Getting Started With Unity Projects, above.) Now, they need to develop the skill of using Unity's interface to create and place objects, as well as writing some simple code to move game elements around the field. Learners should complete Lessons 1.1 and 1.2 in the Create with Code Unit 1 - Player Control Tutorial.

In this tutorial, learners will:

- Create a script
- Connect the script to an object
- Modify the script and see how that changes an object's behavior
- Create obstacles
- Ensure that obstacles can interact with the player avatar truck.

While learners are completing the Learn 1.2 tutorial, they can begin thinking about how scripts are created and used by Unity. Have learners define the "anatomy" of a script. Identify the headers/imports, the class declaration, variable declarations, and any functions in the script. Learners should also be able to explain what a Start and Update function are, and how they're different.

Systems Thinking

Systems Thinking and Game Development Planning Assignment

During the build process, game developers often find themselves facing problems without simple solutions. To deal with these challenges, developers also need a good grasp of the fundamentals of design, problem solving, and an understanding of how everything affects the system as a whole. Introduce a systems model that outlines inputs, processes, outputs, feedback, and goals to illustrate how a change at one place in the process can affect an outcome at another point. Explain how changes to any part of the plan can affect the entire system of the game. Using the example project in Lesson 1.2 of Create With Code, have learners discuss the inputs (such as player movement) and outputs (such as collisions with blocks or falling off the road.) Ask learners to describe how the outputs change when values such as player speed change.

Capstone Development

Project Proposal for Capstone Project

Complete your project proposal document for your *Capstone Project*. Coordinate with your instructor to gain approval for your game idea.

Creating a Game Development Plan

Now that you have identified the game you want to create, it is time to focus on how all of the component parts of the game system are interrelated. As you start building a game, you must also think in linear terms of how the game progresses from start to finish and create a plan for how that process will be developed. This task is managed with flow charts, events, sequences, and alignment to the storyboard script. In your *Game Design Document (GDD)*, create a flow chart that shows all actions that will occur in proper order from start to finish of your game.

Additional Suggested Resources for Unit 5

- [Resource for Sample Flowchart and Game Design: Teach Games: Game design and development resources for educators.](#)
- [The Ultimate Guide to Video Game Writing and Design](#), Dille, Flint
- [Video Game Design/Design](#)

Resource for Additional Scripting Training

- Great Resource for Quick Script/code Introduction: [Unity Game Development in 24 Hours, Sams Teach Yourself, Mike Geig](#)
- [Learn C# scripting in Unity](#)
- [Unity3Dstudent](#)

Game Development Tools Functions and Properties

Activities and Resources

Assets and Interactions

Simple Coding Introduction

Within this unit, learners will gain a deeper understanding of development tools, engines, and level design concepts. They should also continue to develop basic scripting skills required to build any game, and their *Capstone Project*. Students can continue to develop their skills by following the next tutorials in the Create with Code series. Unit 1.3 and 1.4 introduce important concepts related to simple C# coding, camera movement, and player control.

Managing Assets in Unity

Have students step through [tutorials 4 and 5 in this course](#).

These cover how to use the Hierarchy Window as well as the Project window. The Project window is where students can see all of the assets and prefabs they've created or imported into Unity, and organize them for easy retrieval. The Hierarchy window shows all of the game objects in the current scene, and allows users to define Parent and Child relationships between them. Child objects will inherit some properties of their parent objects, most importantly their position. If a parent object moves, a child object will move in the same direction and for the same distance.

Game Design Document Development

Game Design Document (GDD) Basic Gameplay Outline

Begin to draft *sections 2.1* and *2.2* of your *Game Design Document (GDD)*. At this time, focus most of your attention on gameplay. You will need to consider the physics aspects of the interactions that will occur in your game and depict these in a *Game Design Matrix*. Things to consider include, but are not limited to: gravity, motion, elasticity, light, and sound.

Design Challenge

Angry Birds Design Challenge

Design a game similar to Angry Birds. (For example – explore monkeys with slingshots that need to shoot coconuts out of trees.) Your game must incorporate Newton's Three Laws of Motion and his Law of Universal Gravitation. Remember you must account for vertical acceleration and horizontal velocity, as well as distance traveled, and the effect of gravity. (For this game you may ignore friction due to air resistance).

Animation and Physics

Activities and Resources

Animation

Animation within an Interface Activity

As learners design their game interfaces and interactions, it is valuable for them to develop animations that run the game action and richen the game environment. These tutorials will help learners develop technical animation skills in Unity.

Students should complete both tutorials in this project. Once they have, they will understand how to use the animation system to move objects in the environment.

Physics in the Unity Engine

Physics in Game Development

Learners will need to develop skills in the creation of physics within the games they build. The Space Shooter game project helps expose them to the build process and the application of physics within games. Learners may have already included some physics components in their *Capstone Project* at this point, so they may need some time to go back and adapt, tweak, or update previous work.

Capstone Work

Capstone Project

Learners should be actively building their *Capstone Project* in Unity. At this time, learners can animate objects in the game they are creating. By this point, some learners may have already been trying to animate objects in their game. If that is the case, some learners may require additional time to adapt, refine, or update their previous work.

At this point, game development should be progressing and some game elements should become playable within the game environment. Do not be alarmed if there are varying degrees of progress! This is common and may be caused by several factors, including complexity of their game choice and the individual ability of the learner. In some cases, learners may want to return to work already completed, refining or replacing specific sections or entire areas of their game.

Game Developer's Journal Entry

Introduction to GUI and HMI: In your *Game Developers Journal*, describe how: purpose, engagement, interactivity, game management, and environment relate to graphical user interfaces.

Create a listing of primary controls that should be included in a graphic user interface and define the role and purpose of each type of control. In addition, identify the following key terms:

- Assets
- Hierarchy
- Inspector
- Parenting
- Views: Scene, Game, Animation, Light Mapping, Occlusion Culling
- Prefabs
- Project Management: In your *Game Design Document (GDD)*, document your progress by showing your time and recording major changes (or bugs) that you have made as part of your *Project Charter Form (PCF)*.

Game Design Document (GDD)

Draft sections *2.3.4 – User Interface, 2.3.5 - Heads Up Display of 3.2 - Visual Content* in your *Game Design Document (GDD)*.

Player Interaction

Character Controllers Activity

Have students complete the introduction and first tutorial of the second project (Lesson 2) in the Create with Code.

Players will set up a new level, and use if-then statements to build boundaries for player movement. This will introduce them to the basic concepts of level design and of using code to control player movement with conditional statements.

Additional Suggested Resources for Unit 7

- Game UI Discoveries: What Players Want
- Video game user interface design: Diegesis theory
- Human-computer interaction
- Game UI By Example: A Crash Course in the Good and the Bad
- Cartesian Coordinate System
- Graphical User Interfaces: Unity Game Development in 24 Hours

Environments and Level Design

Activities and Resources

Capstone Development

Capstone Project Activities

Learners should be actively building their *Capstone Project* in Unity. Learners will apply lessons learned about physics to objects in the game they are creating. By this point, learners may have been trying to animate their game or they may be ready to begin adding animations. Now they can go back and add physics to objects in order to improve their game performance and realism. Additionally, students should begin building the environments their players are going to move through. Game development is progressing

and game design should be coming together. In some cases, learners may be going back and revise or update certain aspects of their game.

Project Management: Work In Progress (WIP)

There are several Project Management approaches that can be applied to the build process. One simple process it to use a Work In Progress (WIP) naming convention. As a project is built, save files with a WIP code for each major change. This will provide fall back versions, in events of crashes or other problems which may arise. The various versions can then be analyzed, if necessary, to determine when bugs may have occurred. In this assignment, introduce learners to creating running versions of projects using a WIP1, WIP2, WIP3 method and then ask learners to rename their *Capstone Project* files, applying this process.

Level Design Activities

"Block Out" a Level Activity

Have students turn an area that they're familiar with into a video game level. Give everyone the same set of enemies (zombies, for example,) and have them imagine how to make those enemies feel exciting and scary in their chosen environment. Students should draw a basic floorplan for their chosen environment, show the player's path through that location, and point out enemy placements and spawn points. This is referred to as "blocking out" a level, and is an important part of level design, even without making any digital assets.

Create a Digital Environment

Have students build a simple environment in Unity. Use free resources from the Unity Store to add texture to walls, etc. Students should try to create a recognizable place, using only very simple assets. Ask students to think about what the minimum assets necessary are to convey "an apartment," "a cabin," or "a hospital," for example. Students should pull up reference photos to do research.

2D Level Design

Setting up 2D Games in a 3D Environment

Have students continue lessons [2 and 3 in the Create With Code Food Fight Tutorial](). These will develop students skills in code, and allow them to create 2D environments using 3D assets, as well as control the behavior of objects using scripts. It will also introduce the important Unity concept of a Prefab.

Additional Suggested Resources for Unit 8

- 6 Principles of Choke Point Level Design
  - [Resource 1]()
  - [Resource 2]()
- How to Design Gameplay Map Layouts (Complete In-Depth Guide)
  - [Resource 1]()
  - [Resource 1]()
- [Level Design Concepts]()
- [Good level design reference database]()
- [Good overview of level design]() (start with slide 25)

Principles of Camera and Lighting in Game Environments

Activities and Resources

Basics of Cameras

Cameras and Effects

Have students follow [this tutorial.](#)

This will teach them the basics of how to set up cameras within their projects. Cameras are one of Unity's most powerful features, and learning how to set up and manipulate a camera is a crucial skill for students.

Light and Camera Positions

View the provided video clips of various video games and critique the lighting and camera positions. Discuss emotional impact and the effect on player immersion. What feel is created by the lighting and viewpoint? What lighting modalities are used?

- [Amnesia: The Dark Descent](#)
- [Spiderman: The Game](#)
- [Final Fantasy IV](#)
- [Myst III](#)
- [Mirror's Edge](#)

Existing Game Assignment

Download and play [the Mothhead game](#). Discuss the use of lighting and its impact on gameplay. What mood do you think the creators intended to create? How did their choice of color and lighting foster the creation of the intended mood? What is the main camera viewpoint? Why do you think Massive Black chose this point of view for the game?

Evoking Emotions

Create a simple room and light it three different ways to evoke different emotions: sadness, fear, comfort. Save this file for use in the unit on sound and audio.

Document Updates

Worldbuilding in the Game Design Document (GDD)

In your *Game Design Document (GDD)*, complete *sections 2.8 - Design* and *2.81 - Copy*.

For each level, be sure to include the following:

- World Description
- Location
- Time of day: Does it stay the same or change?
- Weather: Does it stay the same or change?
- Are there any pertinent terrain features?

For the story setup, consider the following:

- What main story points set up the player for the current level or mission?
- Story continuity: How does this level support the overall storyline of the game?
- Story points that are reinforced with this mission or level.

Mission or level summary:

- Textual summary of walk-through description of mission or level.
- Topographic map
- Specific objectives or goals: What does the player need to accomplish – what are the challenges of the level?

Opening scene:

- What non-player characters are present and what is their purpose? Note: This may overlap enemies.
- What entities are present in the opening scene for the level?
- Are there any special effects like fireballs, erupting geysers, jagged lighting in the sky or anything else to note about the opening scene?
- How will sound and music be used, if at all?

Gameplay notes for the level:

- Clear rules of gameplay
- Special considerations, exceptions and implications

Game Design Document (GDD) Entry

Your final project may require multiple levels. In your *Game Design Document (GDD)*, sketch a map of how each level will look. Identify the major game elements on each level. How will the player flow through the level? Where are the major chokepoints? Where will challenges and puzzles occur? Do not forget to include lighting and sound requirements.

Project Management

In your *Game Design Document (GDD)*, chart your project progress and identify specific changes, updates or other changes as part of your *Project Charter Form (PCF)*.

Level Design in the Capstone Project

At this point, you should be actively building your *Capstone Project* in Unity. Now is time to create your design levels! Use this opportunity to apply the learning you received about level design and balance within the game you are creating. By this point, you should have enough content to begin integrating objects. You may also be ready to begin adding animations. Lastly, you can also add physics to objects to improve their game performance and realism. As game development is progressing, your game designs should also be coming together. Just remember, you may need to return to update, tweak, or revise your project. That is no cause for concern. Design iteration is a natural part of the game development process!

Additional Suggested Resources for Unit 9

Which books, digital resources, & other materials will be used in this lesson? Listed below is a recommendation of resources to consider for this unit:

- A Layman's Guide to Projection in Video Games
- Lighting tutorial on properties of light and its impact on perception
- Scenes and models available for classroom projects

Principles of Sound and Audio for Games

Activities and Resources

Sound and Audio Design

Sound and Audio Sources for Game Development

Sound design is an important part of creating a fun and engaging game. Choosing the correct sound format can make or break an interactive application or video game. Sometimes music and sounds do not properly support the theme or the outcome of the game. If integrated poorly, they can distract the player or reduce the sense of engagement of being in the game. As game developers storyboard and plan the game, sound and audio files must be selected or designed for use in the game. In order to be effective in sound and audio

design, you must be knowledgeable of sound and audio source formats, resources, sound properties, and parameters.

1. **Create the Roll a Ball Game**
   a. Complete the tutorial in Unity. Add sounds to objects in the game that evoke specific moods, actions, or that increase the level of excitement. Integrate at least four as many sounds and effects, as possible, to add enhance the quality of the game environment. Be sure to add sound effects to objects (e.g. rolling ball) that add realism to the game.

2. **Comparison/Contrast Paper Activity**
   a. Read the audio section in the Unity Manual and develop a brief comparison and contrast paper identifying the predominant music and sound file formats.
   b. Identify the most common files used in audio video game development and describe their primary attributes and capabilities.
   c. List advantages and disadvantages of each file format for game development.

3. **Audio Components Activity:**
   a. View this tutorial on audio and refer to the audio section in the Unity Manual. Utilize those references to define the following terms in your *Game Design Document (GDD)*:
      - 2D & 3D Sound
      - Doppler Effect
      - Sound Rolloff
      - Monophonic & Stereophonic Sound
      - Compression
      - Reverb
      - Loop
      - Effects
      - Audio Clip
      - Pitch

Implementing Simple Sounds

Have students work through the Create With Code endless runner project. Students will get more experience setting up a project, and will specifically get a chance to implement both background music and sound effects.

Intellectual Property

As you have learned so far in this course, it is not easy to come up with original ideas. You have placed significant effort into the development of your game and you expect to own what you have created. The same is true for creators of software, music, sound files, 3D models, and other assets that may be used in the development of a game. The content and assets are considered intellectual property and as such they are owned by the developer. As a game developer, you must respect their ownership of such intellectual property. However there are ways to access and acquire rights to use such intellectual property and how to manage your own IP.

Conduct a web search on copyright and use of intellectual property in game development and define the following in your *Game Design Document (GDD)*:

- Copyright
- Shareware
- Licensing
- Royalties
- Stock Audio
- Trade Secrets
- Patents
- Trademarks

Check for Understanding

Have students conduct a discussion on how licensing might affect the production of their games. What kinds of assets are appropriate to use in a professional game? Which are not? How could a student get access to a specific piece of media to use in their game? How could they replace that piece of media, if they can not gain access?

GDD Development

Game Developers Journal Entry

In your *Game Developers Journal*, discuss your ideas for scene composition in your game. What type of atmosphere do you want to convey and what techniques will you use to accomplish this? What types of lighting do you anticipate needing for your game? Make notes on why you need these types of lighting. Discuss the perspective you want to use and explain why this is the right perspective for your design. Establish desired camera viewpoints and set up lights in the *Capstone Project* to achieve desired mood and atmosphere.

Game Design Document (GDD)

Revisit *section 1.5* in your *Game Design Document (GDD)*. Be sure to include an atmosphere mood board. If you are not familiar with this type of board you will need to do some research first.

Project Management

In your *Game Design Document (GDD)*, chart your project progress and identify specific changes, updates or other changes as part of your *Project Charter Form (PCF)*.

Interfaces and the Build Process

Activities and Resources

Designing User Interfaces

User Interface Activity

Complete a brief research assignment and paper that discusses the difference between a graphic user interface and the human machine interfaces. Research, identify, and describe components that make a good user interface. Discuss why the components are effective. Also identify design components that should be avoided and explain why.

Interface Design Activity

In this activity, you will [open several games of your choosing](#).

Think about what you like and do not like about each user interface. Create several sketches of the user interface for the game you are designing. Think about what controls will be needed and how you want them to appear, as well as a design for buttons and any other design components that you want to include. When you are finished with this assignment, you will have a final design for the game you are building. You will then be ready to create your own custom game interface.

Graphic User Interface (GUI) Practice

Have learners complete a brief design and build exercise to provide them with hands on practice at creating a *Graphic User Interface (GUI)* in Unity. Learners should finish [the following tutorial](#) to get a feel for the basics of Unity's built-in UI components.The way players interact in the game environment can make or break the game, so learners should experiment with different ways of creating actions such as buttons, pop-ups, scene changes or other prompts that create acting and continuation of the game activities. This can be done on a separate project or added within the Capstone Project.

The Build Process

Naming Conventions

Most games are developed in milestones: Prototype, Alpha, Beta, Gold. When a project first begins, it is in Prototype phase. When the prototype is built, the build should be named with the name of the project, Prototype, and then the number of the build. For example, for the first prototype of a project called "Super Puppet World," a good build name might be "SuperPuppetWorld_Prototype0.1"

When the prototype is ready, it becomes an "Alpha Candidate." ("SuperPuppetWorld_AlphaCandidate1").

If that candidate is accepted, the project moves into the Alpha phase, and all of the subsequent builds of that project should be Alpha builds ("SuperPuppetWorld_Alpha0.1")

Use these conventions to name student projects moving forward.

Game Design Document Updates

Game Design Document (GDD) Entry

Create a list of sound clips that you will need to acquire for your game and record the asset names in your *Game Design Document (GDD)*. Identify music style or genres that will help your game become more exciting and engaging. Conduct a web search to find resources for your sound files or create your own. Make sure any sounds you use are not copyright protected.

Game Design Document (GDD)

Draft the audio portion of *section 1.5* in the *Game Design Document (GDD)*.

Project Management

In your *Game Design Document (GDD)*, document your progress by showing your time and recording major changes (or bugs) that you have made as part of your *Project Charter Form (PCF)*.

Capstone Project Activities

First, analyze your game, placing a special focus on audio for player engagement. How can sound help to draw your player into the game? Afterwards, create a new audio script that identifies audio and sound effects that you can apply to make your game more engaging and exciting.

To assist in your analysis, play one or two existing games and investigate how sound made those games engaging. Then apply what you experienced with audio to enhance and engage players within the game you are creating. By this point, you may have already been adding audio to your game. If that is the case, you can review your game and add or adjust audio to improve game performance and realism. Below are a few samples of game promotions or actual games:

- [The Chase Demo](#)
- [Among the Sleep](#)
- [Bowling](#)

Additional Skill Development

The tutorial in this unit is intended to help learners fully understand how to use Unity to add music and sound effects to their game prototype. Students should complete the two tutorials below and then use what they've learned to add at least one background track and three sound effects to their prototype. music and sound effects add to engagement and excitement in the game:

Audio Listeners & Sources

- [Resource 1](#)
- [Resource 2](#)

Once students have completed the tutorial on basic sound sources above, they can move on to [this tutorial](#), which describes in more detail how to use code to trigger and manipulate sounds in your game environment:

Additional Suggested Resources for Unit 11

- [Audio (Unity Manual)](#)
- [Sound Formats and Their Uses in Games](#)
- [Integrating Audio in your Game: The Wise Approach](#)
- [Game Development Essentials: Game Audio Development](#)
- [Adaptive Audio: A Beginner's Guide to Making Sounds for Video Games](#)
- [Hey, That's MY Game! Intellectual Property Protection for Video Games](#)
- Sound File Resources
  - [Resource 1](#)
  - [Resource 2](#)
  - [Resource 3](#)
  - [Resource 4](#)
  - [Resource 5](#)
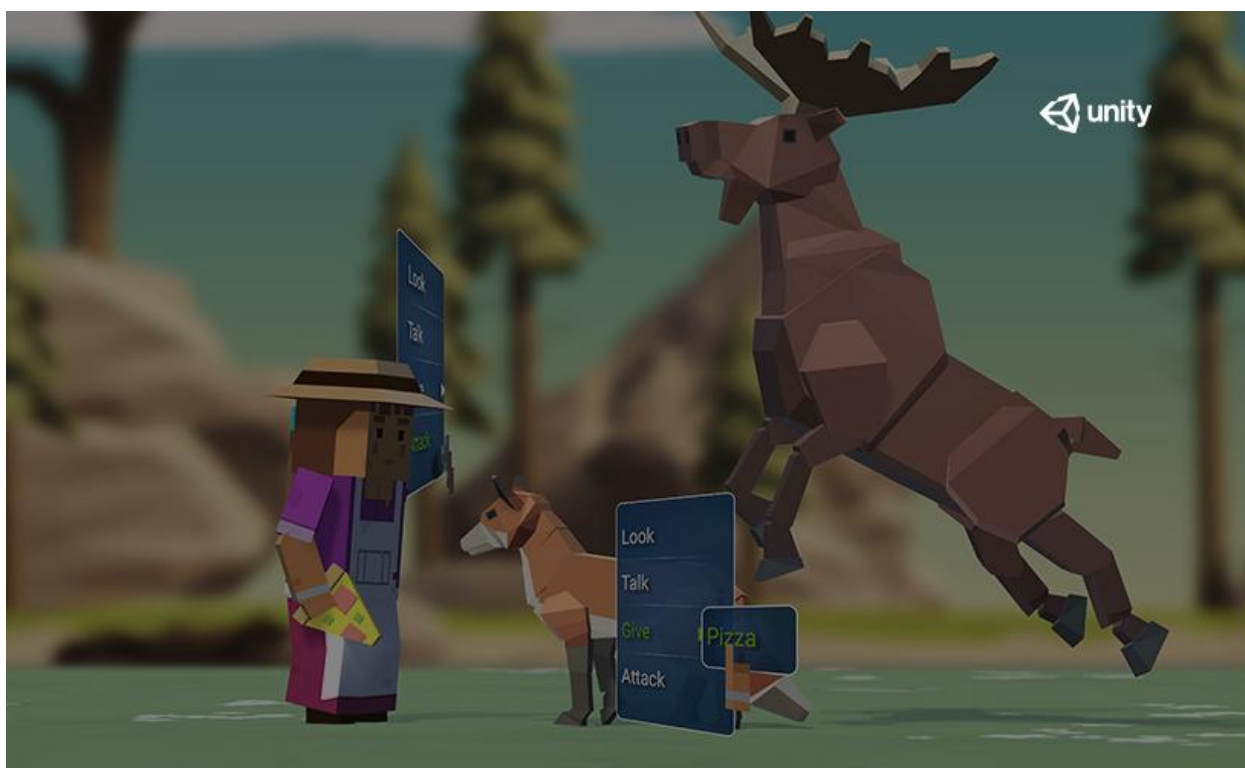
Intermediate Animation and UI

Activities and Resources

Intermediate User Interfaces

Scriptable Objects for UI

The tutorial listed below introduces intermediate level techniques for creating textures, skins, and environments for high quality game interfaces. They are offered to help learners enhance the design of their game. After viewing the tutorials, direct learners to return to their *Capstone Project* and examine ways to improve the user interfaces in their game.

- [Unity GUI Tutorial – Customizing UI with Scriptable Objects](#)

Intermediate Animation Tools and Skills

Intermediate Concepts in Animation

At this point, learners have created their game environment. But how creative, innovative, and effective are their GUI's and animations? The next set of tutorials helps to expand learner skills with animation and GUI's. Direct learners to complete the tutorials listed below. These tutorials will help them improve animation performance and player engagement:

- Cinemachine
- Humanoid Avatars
- Blend Trees

Animation in Game Development Assignment

Write a short paper on Animation in Game Development and discuss briefly the following topics:

1. How does animation occur in video games?
2. What are the requirements for models to be animated?
3. How are models for animation created? And what software is most often used in this process?
4. What is character rigging?

GUI and Animation Practice

Integrate the lessons learned in this unit towards the ongoing development of your *Capstone Project*. You should now possess the knowledge and skills necessary to enhance the animation and better engage the players within your game.

Project Check-In

GDD Progress Check

In your *Game Developer's Journal*, document your progress by showing your time and recording major changes (or bugs) that you have made as part of your *Project Charter Form (PCF)*.

Principles of Quality and Functionality Assurance in Game Development

Activities and Resources

Debugging

In-Class Debugging Activity

The instructor will need to create a C# program, with bugs included, for learners to locate. Instructions for the activity are provided below:

Open up the <provide a simple C# program with bugs.> This C# program's functionality is straightforward. The correct code should enable you <describe what the code should do when working properly>

The learner's task is to utilize the buggy code, taking note of any error messages that appear. Note that not all of the errors will be indicated at the beginning. This is because some of the bugs may prevent entire functions from executing. Only when the general structure of the function is fixed will more obscure bugs, within the function, be detected. Debugging is not an easy task, so the learners should not get frustrated if this assignment takes them a significant amount of in-class time to complete. Below are some hints to help your learners get started.

Debugging techniques:

1. Look at the line indicated by the error message. You will want to go to that line in the code to take a closer look at the error.

2. Print out values. It is often helpful to print out the values of certain variables to check if they are correct, and to tell you what is happening in the program. It is possible the bug is caused by a variable holding an incorrect value. Printing out a value within a loop, for example, will show you how many times a loop executes, or if it executes at all.

3. Adopt proper formatting techniques by spacing out your code and indenting it properly. This will make it easier to read and isolate errors.

4. Fix each error and update your file. After you fix errors, save your code and reload the page. This will show you the results of your debugging, printing out more errors when new problems are uncovered.

Finding common errors:

1. Check code structure. Does the code contain all required parentheses and curly braces? Are commenting tags closed? A missing closing brace will prevent entire functions from working, so you may want to check this at the beginning.

2. Check for misspelled words. An error message stating that some variable or function is not defined may actually be caused by a typo. The program will not understand a mistyped word, so it will be noted as undefined. Check for capitalizations of words as well.

3. Look for incorrect values in loops and conditions. Are your loops executing the right number of times and incrementing by the correct amount? Are array positions correct?

4. Check parameters and return values. You may have neglected to pass in a correct parameter to the function, or the wrong value is being returned from a function.

Game Design Document (GDD) Entry

In your Game Design Document (GDD), create a test plan for your *Capstone Project*.

Capstone Project

Debug your *Capstone Project* game.

Principles of Versioning and Game Release

Activities and Resources

Release

Final delivery of Release Candidate

As the course comes to a conclusion, you should prepare yourself to provide the following:

- A completed *Game Design Document (GDD)*.
- A functional game.
- A 10 minute in-class presentation on how the game may be distributed.
- A description of what could be included in future versions.

- A justification for why the game is ready to be called a release candidate.

Game Developer Task

Return to the game you have been developing and identify the stages of your development that were the Alpha phase, Beta phase, and Release Candidate. Then evaluate and determine how you would number each correctly.

Versioning

Software Versioning Research Project

Open [this website](#), and read all sections on software versioning.

Perform an internet search to find additional source information on software versioning.

Create a narrative brief or paper that defines and discusses the major concepts related to game versioning. Enter the following work in your *Game Developer's Journal*:

- Describe the development stages for game versioning.
- Describe and discuss various numbering schemes used to version games and applications.
- Describe and discuss the topic of sequencing a development project.

Versioning Significance Narrative

Write a brief or narrative paper that discusses the significance and importance of versioning to the following three areas:

- Design Team
- Technical Support
- Product Marketing

Key Term Definitions

Define the following terms in your *Game Developer's Journal*:

- Pre-alpha
- Alpha
- Beta
- Release Candidate
- Gold Release Candidate
- Version Numbers
- Commercial Distribution
- Shareware

Distribution Sources

Conduct a web search to find potential sources for distributing a game. Create a developers distribution resource list for your future reference.