



Curriculum Framework

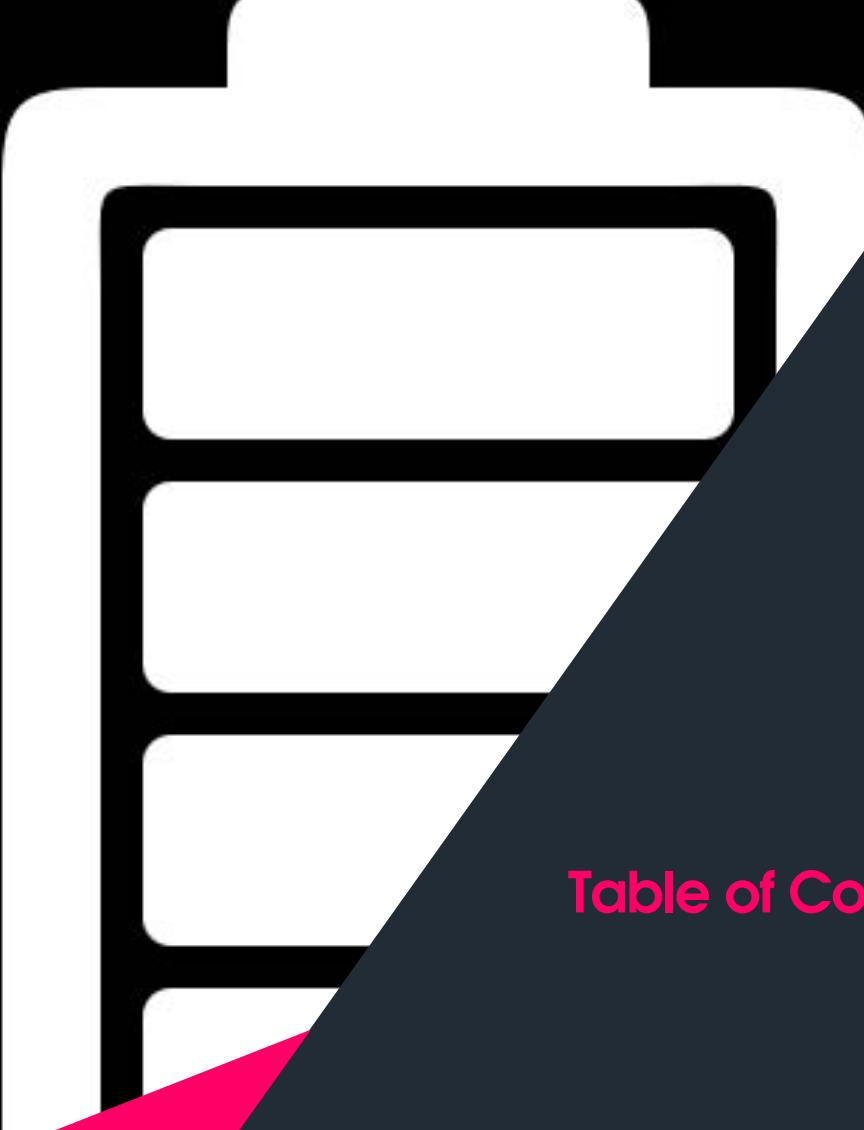


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Introduction

Background

The global media and entertainment industry is complex, expansive, and rapidly evolving. Within it, two exciting, highly creative, and increasingly lucrative fields have emerged that are capturing the hearts and minds of millions: interactive application and video game creation.

The Unity Curriculum Framework was envisioned, designed, and developed by the education team within Unity Technologies. The goal of the curriculum framework is to help education providers produce future professionals who possess the knowledge, skills, and abilities to enter and advance these amazing fields. It is the result of intense research and collaboration by numerous, distinguished authors. It is also a “living, breathing” document, with future updates and revisions already planned.



Purpose

The principal purpose of the Unity Curriculum Framework is two-fold:

1. To encourage education providers to develop and deliver advanced teaching and learning in support of interactive application and video game creation.
2. To empower education providers by providing advanced curricular resources in support of interactive application and video game creation.

The curriculum framework ultimately serves as a resource (i.e. a structured framework) to develop and deliver curriculum. As a resource, readers are encouraged to explore the document, in its entirety, before making a final decision about how best to implement it. Experienced readers may choose to deploy only certain content components and/or leverage specific content resources. In contrast, new readers (i.e. those desiring more instructional design assistance) may choose to deploy the curriculum framework as-is, in its entirety. No matter how it is utilized, Unity Technologies advises all readers that the subjects of interactive applications and video creation are complex, highly progressive, and rapidly changing. And while it may appear comprehensive in breadth and depth, the curriculum framework is still intended to guide readers in the design, development, and delivery of the learning they produce.



Intended Audience

The Unity Curriculum Framework was designed for institutional educators that need to develop robust learning and deliver adaptive teaching, to a continuous group of learners, over a finite period of time. Every aspect of the curriculum framework was maximized to enable learning content creation and provide learning resource deployment in this type of environment.

Unity Technologies recognizes that many different types of education providers desire learning resources in support of the Unity Game Editor and Unity Game Engine. Unity Technologies also realizes that different learning environments and different learning goals often cause and accompany different reader needs. As such, readers outside the intended audience are still encouraged to utilize the curriculum framework as they may.

Approach

Conceptual Model



The Unity Curriculum Framework is designed to engage learners with hands-on activities and exercises. The activities and exercises are intended to provide learners the opportunity to develop the skills necessary to manage the game creation process. As a result, learners will gain knowledge and experience in all aspects of the process. The content in the curriculum framework can be approached in several different ways and is easily adaptable to a variety of situations. While each unit contains suggested sample exercises, educators are provided numerous topics and clear learning objectives to allow them the freedom to customize or deploy as they see fit.

Technical Model

The Unity Curriculum Framework employs a modular, competency based, interactive (i.e. hands-on) instructional model. Learners completing all components of study should gain a broad understanding of what is involved in the creation of interactive application and video game creation process; from concept inception to final release.

The recommended duration of time required to complete the entire curriculum framework is 36 calendar weeks, but can (and should) be adjusted, depending upon various real-world environmental factors. These factors include, but are not limited to, the learner's age, experience level, and the frequency of their availability for learning.

Components of Study

The Unity Curriculum Framework is comprised of 14 distinct components or “units” of study. Each unit of study functions like a gear in a mechanical device, adding unique, specific value to the machine as a whole.

Each unit of study contains the following, standardized sections (in order of appearance):

- Title
- Unit Description
- Major Topics
- Learning Objectives
- Course Outline
- Instructor-Led Training (ILT) Activities
- Self-Pace Learning (SPL) Activities
- Standards Alignment Guide
- Assessment Rubric(s)
- Assessment of Learning Objectives
- Suggested Resources



The 14 units of study provide learning opportunities through a wide variety lessons and experiences to help learners grasp and fully understand what is involved in being an effective developer. Through research, demonstrations, game play, structured lessons, and tactical training activities, learners will fully experience the interactive application and game creation process.

Modularity and Linearity

The units of study were strategically designed with modularity in mind. This strategy provides optimum flexibility for learning content delivery. The units of study can be delivered linearly, as originally outlined with the Unity Curriculum Framework. However, experienced readers may choose to deliver the units in a different sequence, in order to better align the curriculum framework with their existing learning objectives, learner abilities, or other factors.

Capstone Project

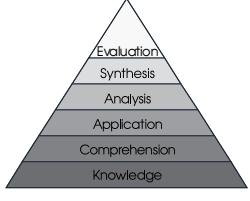
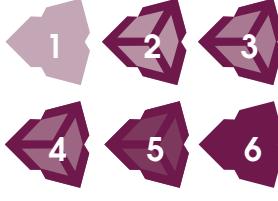
The units of study are followed by a final, culminating, critically important component, referred to as the “capstone project.” The *Capstone Project* provides each learner the ability to apply all they have learned towards the creation of a unique interactive application or video game.

The units of study, combined with the *Capstone Project*, provide a significant quantity of strategic guidance and tactical resources for educators to develop and deliver a learning experience that engage learners and prepare them to become professional interactive application and video game creators.

The Unity Curriculum Framework provides an educational model to state and measure learning outcomes that is aligned with Blooms taxonomy. Within each unit of study, the Learning Objectives section and the Assessment of Learning Objectives section provide:

- A series of learning objectives or learning objective assessment statements
- A Blooms cognitive domain mapping for each statement
- A level of difficulty indication for each statement

Example

Blooms Domain	Learning Objective	Level of Difficulty
	Identify basic game design principles, reciting common choices, styles, and/or aesthetics (e.g. visual, audial, interactive, and narrative).	

Learning objectives (and their assessments) are provided to help the educator develop and deliver effective learning. The curriculum framework offers these lists as a start, not a finish. Readers are encouraged to explore Blooms taxonomy, to reflect on the appropriateness of the learning objectives provided within each unit of study, and to refine the lists (as necessary) for the benefit of their learners.

For each learning objective statement, a level of difficulty indication is also provided. The level of difficulty gauge is aligned with the cognitive domain levels within Blooms taxonomy. It serves to indicate and remind readers that higher level domain mappings often (but not always) present greater challenges towards achieving and measuring learning goals in the classroom. That being said, high level domain mappings have often been regarded as a valuable ingredient for producing incredibly capable learners.

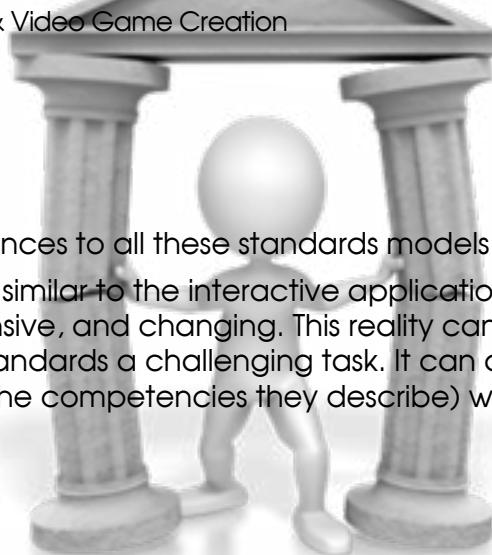
Standards Alignment

The Unity Curriculum Framework is designed and built upon the Unity Professional Standards for Interactive Application and Video Game Creation. As a result, the curriculum framework is closely aligned to several contemporary and prominent standards initiatives today, including:

- Unity Professional Standards for Interactive Application & Video Game Creation
- Common Core State Standards (CCSS)
- STEM Career Clusters (SCC)
- Next Generation Science Standards (NGSS)
- 21st Century Skills (T21C)

Within each unit of study, readers will be provided references to all these standards models.

Standards initiatives, in the field of education today, are similar to the interactive application and video game creation industry itself: complex, expansive, and changing. This reality can make the task of aligning learning content to multiple standards a challenging task. It can also make the process of differentiating the standards (and the competencies they describe) within a singular document a feat in itself!



Technical Training

While the Unity Curriculum Framework is adaptable to a variety of game development software applications, the document is intended to aid in the technical learning of the Unity Game Editor and Unity Game Engine.

While every effort has been made to align and suggest specific Unity 3d tools, features, and techniques within each unity of study, the reader is encouraged to reference all resources available and consider their appropriateness.

The curriculum framework also references a broad selection of high quality learning tutorials, manuals, and informational resources readily available within the Unity Learn website and the online Unity Community. Readers are strongly encouraged to explore and utilize these highly visual and interactive resources.

Assessment

Within the Unity Curriculum Framework, both formative and summative strategies have been applied to formally and effectively measure learning.

One important opportunity for formative assessment arises from the (recommended) requirement of learners to regularly maintain their *Game Developer's Journal*. Another formative assessment opportunity arises from their (recommended) requirement to manage their *Game Design Document (GDD)*.

The successful completion of the *Capstone Project* provides a summative assessment, indicative of learner competency and their ultimate ability to create an interactive application or video game that meets their stated goals.



The curriculum framework provides additional opportunities for assessment. These opportunities are highlighted within the units of study and take the form of activities, tests, assignments, and exercises. Some of these opportunities are even demonstrated with sample *Assessment Rubrics*. Rubrics provide an excellent strategy for conveying expectations to learners, as well as creating a foundation to help learners organize their efforts on any given assignment. While several *Assessment Rubrics* are provided, readers are encouraged to develop and deploy their own rubrics in order to meet the specific needs of their individual learners and learning environments.

Resource Guide

Within the Unity Curriculum Framework, both formative and summative strategies have been applied to formally and effectively measure learning. The Unity Curriculum Framework contains a resource guide for educators and their learners. In addition to a glossary, the resource guide contains valuable samples, templates, and other documents that are referenced frequently within the curriculum framework. Unity Technologies recommends all readers familiarize themselves with the resource guide prior to deploying the curriculum framework.

Deployment

Critical Daily Documents

Before progressing into the units of study, educators should introduce their learners to two critically important documents within the Unity Curriculum Framework:

1. Game Developer's Journal
2. Game Design Document (GDD)

At the onset of the learning process, learners should be directed to complete unit specific requirements for these two documents on a regular (i.e. daily) basis. Templates for both of these documents are available in the resource guide. Maintenance of the *Game Developer's Journal* serves to keep students focused and on track, while offering educator's ongoing insight into the learner's progress. Furthermore, routine contributions to the *Game Design Document (GDD)* will produce a practical version of the final documentation that is typically requested (within industry) to accompany any real-world interactive application or video game product release.

Instructor-Led Training (ILT)

Each unit within the Unity Curriculum Framework provides recommendations for Instructor-Led Training (ILT) activities. These activities may include a collection of tutorials, project management exercises, and small group assignments. The activities are provided to the educator, offering a high level, comprehensive overview of relationships between course components and the technical skill building opportunities that are connected.

Look for the ‘educator helping learner’ graphic to indicate when instructor-led training is recommended.



Self-Pace Learning (SPL)

Each unit, within the Unity Curriculum Framework, also provides recommendations for Self-Pace Learning (SPL) activities. These activities have been designed to enable self-paced, out-of-classroom study. The Self-Pace Learning (SPL) activities ultimately provide a variety of exploratory and reflective learning opportunities for the learner. These activities may include a collection of journal entries, research, Game Design Document (GDD) enhancements, and game play testing.

Individuality

In every aspect, the Unity Curriculum Framework was designed to encourage educators to recognize, prepare for, and permit learner individuality throughout the entire learning process. Individuality may take the form of one learner exploring more about a unit topic (of special interest) than another. Individuality may also take the shape of allowing each learner to choose the complexity of projects they pursue or the genre of products they produce.

Personalization

In every aspect, the Unity Curriculum Framework was also designed to encourage educators to recognize, prepare for, and permit learner personalization throughout the entire learning process. Personalization may take the form of a unique approach to the creative appearance of their *Game Developer’s Journal*. Personalization may also take form within the strategic design of their interactive application or video game submission.

In cases of individuality and personalization, the curriculum framework recognizes that these are not simple tasks for the educator. In fact, integrating individuality and personalization into a curriculum may serve to be one of the most difficult challenges faced by the educator today. However, the curriculum framework also challenges educators to strive to do their best. And, for some, that may involve taking risks and venturing (e.g. learning) far beyond the normal comfort zone.

The authors of the Unity Curriculum Framework cannot stress the importance of integrating individuality and personalization within the curriculum. At the end of the day, these are guiding principles for empowering learners (and professionals) to produce the most creative and innovative interactive applications and video games on the market today.

UNIT 1: INTRODUCTION TO GAME DESIGN



UNIT 1: INTRODUCTION TO GAME DESIGN

- 1.A: Unit Overview
- 1.B: Instructional Resource Guide
- 1.C: Learning Activities Guide
- 1.D: Standards Alignment Guide
- 1.E: Assessment Reference Guide
- 1.F: Suggested Resources

1.A: UNIT OVERVIEW

1.A.1: UNIT DESCRIPTION



Activities in this unit of instruction are designed to provide a high level overview of game design and the game creation process. Learners will be introduced to various game genres during this unit. They will also become familiar with elements of game play and project management concepts, as related to interactive application and video game creation.

1.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Game Design Overview (i.e. How are games created? Who creates them?)
- Game Genres (e.g. first-person shooter, platform, racing, strategy)
- Game Editor Introduction (e.g. projects, packages, navigation, views)
- Game Element Overview (e.g. players, goals, narrative, decisions, balance)
- Game Play Overview (e.g. rules, interactive modes, challenge types, level design)
- Project Management Overview (e.g. charters, work breakdown structures, projects)

1.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

1. Identify basic game design principles, reciting common (visual, audial, interactive, narrative, etc.) choices, styles, and/or aesthetics.
2. Demonstrate the ability to review and summarize contemporary video games; examining intent, form, and functionality.
3. Implement the fundamental concepts of project management within the context of the interactive application and video game development process.
4. Utilize the game editor user interface to open and organize a simple project or scene.
5. Differentiate primary components within the game editor; examining their purpose and function.
6. Distinguish contemporary game genres and platforms.
7. Devise systems to organize and illustrate the interactivity and player immersion that exist within contemporary video games.
8. Reconstruct the rules of contemporary games, in order to improve the game play experience.
9. Critique contemporary video games; providing adequate arguments and justification.
10. Interpret the role of game narrative and game play; evaluating its impact on the interactive storytelling environment.

1.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

1.B.1: COURSE OUTLINE

1. Game/Application Design Overview
 - a. What is a game/application and how is it created?
 - b. What makes a game enjoyable?
 - c. Knowing the players
 - d. Game genres
 - e. Game Platforms
2. Game Element Exploration
 - a. Narrative formation
 - b. Game design
 - c. Objectives
 - d. Player options
 - e. Sequences
 - f. Mechanics
 - g. Game aesthetics
 - h. Dramatic elements
 - i. Multimedia inclusions
3. Game Play
 - a. Game theory introduction
 - b. Balance
 - c. Challenge development
 - d. Level design
4. Game Analysis
 - a. Game play critical analysis
 - b. Functionality
 - c. Aesthetics
 - d. Game play
5. Project Management for Game Development
 - a. What is Project Management?
 - b. Why is Project Management important?
 - c. The Four Phases of Project Management (model)
6. Unity Editor for Game Creation
 - a. Setting up a new project
 - b. Navigating within the Unity Editor



1.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

1.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

1.C.1.A: Exploring the Unity Editor

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.

Introduce learners to this topic by having them complete the following tutorials, using the Unity Editor:

1. Learning the Interface Tutorial:
<http://docs.unity3d.com/Manual/LearningtheInterface.html>
2. Editor Basics:
<http://unity3d.com/learn/tutorials/modules/beginner/live-training-archive/editor-basics>

1.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES



1.C.2.A: Game Developers Journal Entry

Within your *Game Developers Journal*, enter at least five core game (i.e. product) ideas to be considered for your 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 your final *Capstone Project* submission.

1.C.2.B: Contemporary Game Assignment

1

Download Candy Crush Saga onto any game play device.

The game can be found at:

<http://candycrushplayfreegame.com>.

2

Play the game long enough to understand the directions and the overall objective(s) of the game.

3

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.

4

Based on your own observations, 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.

1.D: STANDARDS ALIGNMENT GUIDE

1.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 1.1.3. Explain the role of iteration in the design process.
- ⇒ 1.1.4. Explain the difference between game mechanics and gameplay.
- ⇒ 1.6.2. Demonstrate understanding and ability to use game mechanics to improve gameplay.
- ⇒ 1.1.6. Assess and describe the basic gameplay from a existing game.
- ⇒ 1.1.7. Analyze and evaluate the effectiveness of several game mechanics used in a contemporary game.
- ⇒ 1.1.8. Investigate the concept of “Interactive Narrative” and explain how it could pertain to game design.
- ⇒ 1.1.9. Explain the relevance of ambiance and environment in game design.
- ⇒ 1.1.10. Determine the relevance of character development, backstory, and attributes (power, speed, intelligence, empathy, etc.) in game design.
- ⇒ 1.1.11. Differentiate basic game player types and objectives with examples (Thrill seekers, Socializers, Explorers, Achievers).
- ⇒ 1.1.12. Evaluate and describe various 2D & 3D, single & multi-user genre.
- ⇒ 1.1.16. Describe available target platforms, their capabilities and constraints.
- ⇒ 1.1.20. Examine an existing game and critique its design with respect to functionality and usability.
- ⇒ 1.1.21. Examine an existing game and critique its design with respect to artistic impression and emotional response.
- ⇒ 1.1.22. Examine an existing game and attempt to determine the developer’s target demographics and its appeal for basic player types & objectives.



1.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.WHST.6-8.2](#) Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- ⇒ [CCSS.ELA-Literacy.CCRA.SL.1](#) Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others’ ideas and expressing their own clearly and persuasively.

1.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC01 ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.

1:D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Creativity and Innovation
 - Think Creatively
 - Implement Innovations
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
- ⇒ Life and Career Skills
 - Initiative and self-direction
 - Manage Goals and Time
 - Work Independently
 - Be Self-Directed Learners



1.D.5: NEXT GENERATION SCIENCE STANDARDS (NGSS)

- ⇒ NGSS3: Planning and carrying out investigations
- ⇒ NGSS4: Analyzing and interpreting data

1.E: ASSESSMENT REFERENCE GUIDE

1.E.1: Game Modification Plan – Assessment Rubric



Quality of Response	Unacceptable	Basic	Proficient	Distinguished
Game Modification Task Sheet is not fully thought out and complete. Answers are incomplete and do not show evidence of completion of the Game Modification Plan.	Game Modification Task Sheet is complete, but the objective of the game is not clearly articulated and fully detailed. Likes and dislikes are identified, but there is no clear explanation as to why. Minimum answers are provided for each question.	Game Modification Task Sheet is complete and includes an in-depth analysis of the game. The game objective is clear and the responses to the questions are well articulated and explained. Responses demonstrate a good grasp of how a contemporary game review process works and how a game may actually be revised.	In-depth analysis of the game is very evident within the <i>Game Modification Task Sheet</i> ; responses illustrate a deep and thoughtful review. Multiple new views are offered on why the existing game is successful. A strong rationale is provided for likes and dislikes of the game actions, design, and appearance; additional factors are also provided.	Recommendations and ideas within the <i>Game Modification Plan</i> are extremely clear and concise, and include unique recommendations to improve the game. Realistic (i.e., workable) and valid suggestions are offered explaining how they will improve the game. Multiple change ideas are offered and are clearly explained. The revised objective of the game successfully complements what the revised game will be.
Modification Plan	The Game Modification Plan is incomplete, does not include valid suggestions for game improvement.	Revised objective of the game as indicated within the Game Modification Plan is not very different from original. Some changes are offered for gameplay or game design; some reasons are offered for why suggested changes would not be included.	The Game Modification Plan depicts new ideas for modifying the game and reflects a well-articulated idea or concept with regard to workability. Responses show understanding of how the gameplay and/or game design will be affected along with a good analysis of why game developers may not have implemented these ideas.	The work is highly creative, offering multiple alternative approaches to changing the game from its original design. Familiar methods and approaches have been combined in new and innovative ways.
Creativity	The work is not very creative. The work does not offer new approaches or ideas.	The work is somewhat creative, offering some new ideas. Familiar approaches, ideas, and methods were provided in the work.	The work is creative, offering new ideas and approaches to change the game in a unique way. The work takes some risks in ideas suggested for the revision.	Assignment has been thoroughly proofread and contains no errors.
Mechanics: spelling, grammar, punctuation	Assignment is delivered sloppy and includes many errors.	Assignment was probably not proofread as it includes several errors.	Assignment has been proofread and includes minimal errors.	

1.E.2: ASSESSMENT OF LEARNING OBJECTIVES

1. From memory, learners can list or label basic game design principles.
2. Learners can research online game reviews, citing the vocabulary related to game play and design elements.
3. Learners can consistently and correctly apply project management fundamentals as an essential function of game development.
4. Learners can demonstrate how to open a pre-developed scene, view its components, and configure the user interface within the game editor.
5. Learners will be able to differentiate the following game development components:
 - i. Assets
 - ii. Hierarchy
 - iii. Inspectors/properties
 - iv. Parenting/Nesting
 - v. Views: Scene, Game Animation, Light mapping, Occlusion Culling
 - vi. Prefabs
6. Supplied with a list of contemporary games, learners will consistently and correctly characterize genre inclusion; providing adequate justification for genre selection. Learners can also differentiate popular gaming platforms; describing the advantages and disadvantages in terms of hardware (i.e. peripheral) features and game play modalities.
7. Learners can design a game rating system to rank interactivity and player immersion.
8. Based on the review created by the learner, the learner will formulate a *Game Modification Task Sheet* and a *Game Modification Plan*; identifying key differentiators of the game, possible issues, and/or areas for improvement.
9. Upon selecting a game of their liking, learners can write a critique using appropriate standards and terminology.
10. Within small group interactions, learners can argue or defend the value of game narrative and game play; evaluating its impact on the game being discussed and influencing others within the group.

1.F: SUGGESTED RESOURCES

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

1. http://educade.org/lesson_plans/reflect-on-and-modify-games-with-the-help-of-the-games-we-play
2. *Just Enough Project Management: The Indispensable Four-Step Process for Managing any Project Better, Faster, Cheaper* - Curtis R. Cook, Ph.D - McGraw-Hill Professional Publishing



UNIT 2: CRITICAL THINKING IN GAME DESIGN



UNIT 2: CRITICAL THINKING IN GAME DESIGN

- 2.A: Unit Overview
- 2.B: Instructional Resource Guide
- 2.C: Learning Activities Guide
- 2.D: Standards Alignment Guide
- 2.E: Assessment Reference Guide
- 2.F: Suggested Resources

2.A: UNIT OVERVIEW

2.A.1: UNIT DESCRIPTION



Activities in this unit of instruction are designed to develop critical thinking and problem solving skills. Learners will be introduced to various strategies and techniques for idea generation, problem solving, and critical analysis.

2.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Critical Thinking (e.g. definition, comparison to creative thinking, well-developed arguments)
- Idea Generation Techniques (i.e. What is brainstorming? How is it useful? What are the rules?)
- Critical Thinking for Game Analysis (e.g. purpose in game design, function in game development)
- Problem Solving Basics (e.g. priorities, methodologies, planning)

2.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

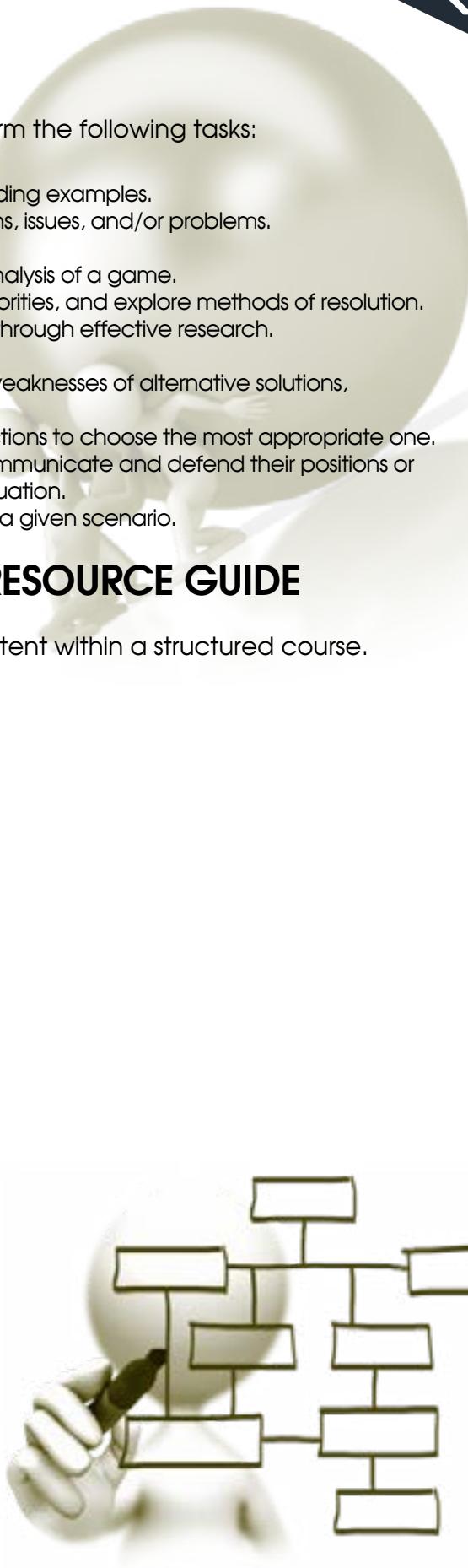
1. Define creative and critical thinking.
2. Explain contemporary problem solving methods, providing examples.
3. Demonstrate the ability to determine essential questions, issues, and/or problems.
4. Utilize contemporary problem solving techniques.
5. Differentiate between a game review and a critical analysis of a game.
6. Breakdown a problem into its component parts, set priorities, and explore methods of resolution.
7. Gather, generate, and evaluate relevant information through effective research.
8. Develop informed conclusions/solutions.
9. Use logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
10. Consider the relative costs and benefits of potential actions to choose the most appropriate one.
11. Use oral and written communication skills to clearly communicate and defend their positions or conclusions with regard to a story specific issue or evaluation.
12. Predict when problems arise or are likely to arise within a given scenario.

2.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

2.B.1: COURSE OUTLINE

1. Introduction to creative and critical thinking practices
 - a. What does it mean to think critically?
Think creatively?
 - b. Critical thinking terms: ambiguity, assumptions, values, emotions, argument, fallacy, thinking barriers, language, etc.
 - c. Tools for critical thinking (e.g. SWOT analysis)
 - d. Critical thinking and the evaluation process
2. Idea Generation
 - a. Introduction to brainstorming and mind mapping
 - b. Idea sorting
 - i. Immediate usefulness
 - ii. Areas for exploration
 - iii. New approaches to problem solving
3. Phases of decision making/problem solving
 - a. Problem identification
 - b. Information gathering
 - c. Brainstorm solutions
 - d. Compare the pros and cons of each option
 - e. Test selected solution
 - f. Evaluate the effectiveness of the solution



2.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

2.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

2.C.1.A: Exploring the Unity Editor

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.

Learners can complete the following brief tutorial on game objects in the Unity Editor:

<http://unity3d.com/learn/tutorials/modules/beginner/live-training-archive/gameobjects>

Learners can reference the Unity Manual for additional background on game objects.

<http://docs.unity3d.com/Manual/TheGameObject-ComponentRelationship.html>

2.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

2.C.2.A: Game Developers Journal



Within your *Game Developers Journal*, use mind-mapping techniques to illustrate your top two or three ideas (from the five ideas generated during Unit 1). At this point, you should focus on producing a high level mind-map, illustrating only a few levels deep. You will continue to refine your decision and add detail to your map as the learning progresses.

2.C.2.B: Contemporary Game Assignment

1

Select one of the games found at: <https://unity3d.com/showcase/gallery/games>.

Play on your own, if the mechanics allow it. If the game only supports multi-player 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.

2

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?

3

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!

2.C.2.C: Critical Thinking Assignment

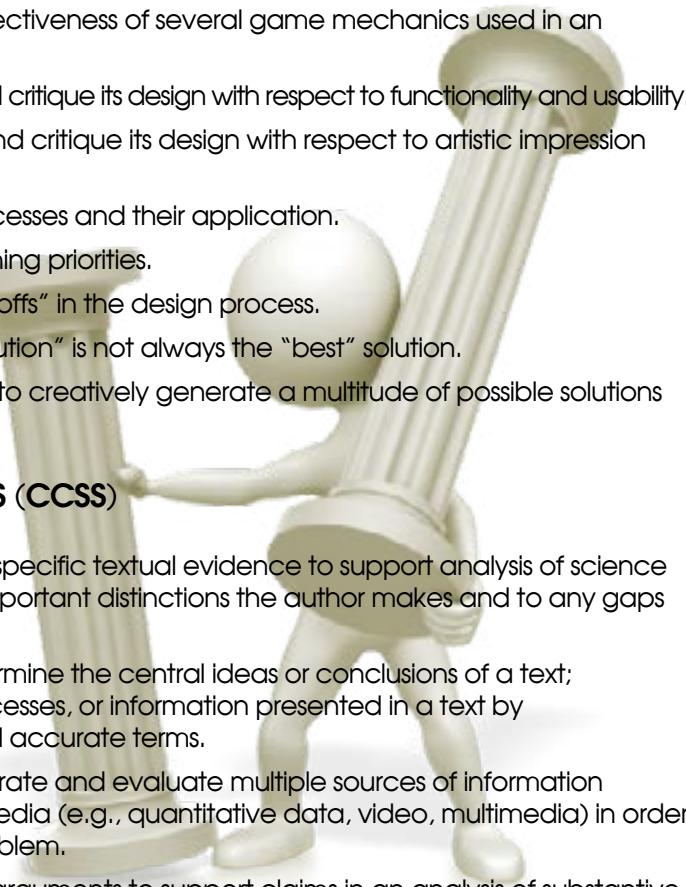
Do you agree or disagree with the following statement? Explain your response.

"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."



2.D: STANDARDS ALIGNMENT GUIDE

2.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- 
- ⇒ 1.1.7. Analyze and evaluate the effectiveness of several game mechanics used in an existing game.
 - ⇒ 1.1.20. Examine an existing game and critique its design with respect to functionality and usability.
 - ⇒ 1.1.21. Examine an existing game and critique its design with respect to artistic impression and emotional response.
 - ⇒ 1.2.3. Describe problem-solving processes and their application.
 - ⇒ 1.2.5. Describe methods for establishing priorities.
 - ⇒ 1.2.6. Explain the concept of “tradeoffs” in the design process.
 - ⇒ 1.2.7. Explain how the “optimum solution” is not always the “best” solution.
 - ⇒ 1.3.8. Use brainstorming techniques to creatively generate a multitude of possible solutions to a stated problem.

2.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.RST.11-12.1](#) Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- ⇒ [CCSS.ELA-Literacy.RST.11-12.2](#) Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- ⇒ [CCSS.ELA-Literacy.RST.11-12.7](#) Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- ⇒ [CCSS.ELA-Literacy.W.11-12.1](#) Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- ⇒ [CCSS.ELA-Literacy.W.11-12.2](#) Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

2.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
- ⇒ SCC04 INFORMATION TECHNOLOGY APPLICATIONS: Use information technology tools specific to the career cluster to access, manage, integrate, and create information.

2:D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Creativity and Innovation
 - Think Creatively
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
 - Use and Manage Information
 - ICT (Information, Communications and Technology) Literacy
 - Apply Technology Effectively
- ⇒ Life and Career Skills
 - Flexibility and Adaptability
 - Be Flexible
 - Initiative and self-direction
 - Manage Goals and Time
 - Work Independently
 - Be Self-Directed Learners



2.D.5: NEXT GENERATION SCIENCE STANDARDS (NGSS)

- ⇒ NGSS1: Asking questions (for science) and defining problems (for engineering)
- ⇒ NGSS3: Planning and carrying out investigations
- ⇒ NGSS8: Obtaining, evaluating, and communicating information

2.E: ASSESSMENT REFERENCE GUIDE

2.E.1: Critical Analysis Assignment – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Problem Identification	Issue/problem to be considered critically is stated without clarification or description. Represents the issues inaccurately or inappropriately.	Identifies main issues, but does not summarize or explain them clearly or leaves some terms undefined. Some issues remain ambiguous or are unexplored. Some boundaries are undetermined. Some backgrounds are unknown.	Successfully identifies and summarizes the main issues, but does not explain how/why they are problems or questions. Some identification of embedded or implicit issues, addressing their relationships to each other.	Clearly identifies and summarizes main issues. Successfully explains how/why they are problems or questions. Identifies embedded or implicit issues, addressing their relationships to each other.
Critical Thinking	Offers biased interpretations of evidence, statements, graphics, questions, information, or points of view of others. Fails to identify or hastily dismisses strong, relevant counter-arguments. Ignores or superficially evaluates obvious alternative points of view. Regardless of the reasons, maintains or defends views based on self-interest or preconceptions.	Some misinterpretation of evidence, statements, graphics, questions. Partial ability to identify strong, relevant counter-arguments. Often ignores or superficially evaluates obvious alternative points of view. May draw unwarranted or fallacious conclusions. Seldom explains reasons. Regardless of the evidence or reasons, maintains or defends views based on self-interest or preconceptions.	Accurately interprets evidence, statements, graphics, questions, etc. Identifies relevant arguments (reasons and claims) in support of and in opposition to the position. Offers analyses and evaluations of both obvious and subtle alternative points of view. Draws warranted non-fallacious conclusions. Justifies some results or procedures, explains reasons	Accurately interprets evidence, statements, graphics, questions, etc. Identifies relevant arguments (reasons and claims) in support of and in opposition to the position. Offers analyses and evaluations of both obvious and subtle alternative points of view. Draws warranted, non-fallacious conclusions. Justifies most results or procedures, explains reasons.
Evaluation of Evidence	Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position.	Questions some assumptions. Identifies several relevant contexts when presenting a position. Successfully identifies data and information that counts as evidence but fails to thoroughly evaluate its credibility.	Identifies own and others' assumptions and several relevant contexts when presenting a position. Identified all important evidence and rigorously evaluates it.	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position. Provides new data or information for consideration.
Conclusions and Inferences	Conclusions are not justified. Does not recognize limits of conclusions nor implications of assumptions.	Develops reasonable conclusions from the data but does not convincingly link conclusions back to the data. Does not consider consequences or implications of assumptions.	Develops logical conclusions and communicates a logical path from data to conclusion. Incomplete consideration of consequences.	Develops logical conclusions and communicates a logical path from data to conclusion. Recognizes limits of conclusions and considers consequences. Identifies any assumptions that may influence conclusion.

2.E.2: ASSESSMENT OF LEARNING OBJECTIVES

1. Learners can define the meaning of critical thinking and creative thinking.
2. Learners can explain the Six-Step Problem-Solving Process and can associate the steps with real-world examples.
3. Given a paragraph, learners can determine the key questions or issues within the content.
4. Learners can use brainstorming techniques to generate at least five possible solutions for a given situation or problem.
5. Learners can distinguish a game review versus a critical analysis of a game.
6. Given a series of scenarios, learners can recognize and prioritize likely failure points; studying common modifications utilized to avoid such failure points.
7. When supplied with an unfamiliar topic, learners can demonstrate an ability to research the topic; correlating multiple sources of relevant information.
8. Learners can compile all information to propose the most valid solutions.
9. Supplied with a particular problem scenario, learners can generate a range of solutions and courses of action with benefits, costs, and risks associated with each.
10. After being presented with an application design problem that includes multiple possible solutions, the learner will analyze the strengths and weaknesses of each solution, deciding on a best option.
11. Learners can play a game reviewed in an online gaming magazine, write their own review, and compare it with the online reviewers; defending their opinions and conclusions.
12. Given a series of scenarios, learners can predict failure points and recommend modifications to avoid the failure points.

2.F: SUGGESTED RESOURCES

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

1. Game analysis Guidelines: http://ocw.mit.edu/courses/comparative-media-studies/cms-300-introduction-to-video-game-studies-fall-2011/assignments/game-analysis/MITCMS_300F11_GameAnaGuide.pdf
2. <http://www.criticalthinking.org/ctmodel/logic-model1.htm>: Useful to help learners understand and perform critical thinking.
3. Critical Thinking PowerPoint: <http://www.slideshare.net/balibarbara/critical-thinking-powerpoint-17741703>
4. The Six-Step Problem-Solving Process: <http://www.aleanjourney.com/2012/05/six-step-problem-solving-process.html>
5. Unity Online Manual Document: <http://docs.unity3d.com/Manual/TheGameObject-ComponentRelationship.html>
6. Unity Online Tutorial Video: <http://unity3d.com/learn/tutorials/modules/beginner/live-training-archive/gameobjects>



UNIT 3: GAME DESIGN THEORY



UNIT 3: GAME DESIGN THEORY

- 3.A: Unit Overview
- 3.B: Instructional Resource Guide
- 3.C: Learning Activities Guide
- 3.D: Standards Alignment Guide
- 3.E: Assessment Reference Guide
- 3.F: Suggested Resources

3.A: UNIT OVERVIEW

3.A.1: UNIT DESCRIPTION



Activities in this unit of study are designed to foster an understanding of fundamental game design principles, including: genres, goals, mechanics, player motivation, structure, and gameplay. Learners will analyze different types of 2D and 3D games, create proposals for building common game types, and begin learning the process of building games using the Unity Editor.

3.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Game Genres (e.g. defining characteristics, impact to gameplay)
- Game Environments (e.g. 2D vs.3D, impact on ease of navigation)
- Game Assets (e.g. models, materials)
- Goals (e.g. objectives, logic, challenges)
- Game Mechanics (e.g. operational, constitutive, implicit rules)
- Player Motivation (e.g. playability; balancing challenge, risk, and reward)
- Symmetry and Balance (e.g. “fairness” of the game, appropriateness of the challenge level)
- Game Structure (e.g. space, time)
- Game Development Cycles (e.g. iterative processes, rapid prototyping models)

3.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

1. Identify common game genres.
2. Categorize contemporary game genres.
3. Summarize important considerations in game design.
4. Describe rule creation and elements of player challenge.
5. Explain the theories behind player motivation.
6. Generate models and materials for project(s) created within the Unity Editor.
7. Apply fundamental concepts of project management.
8. Create a game proposal for a one button game.
9. Differentiate 2D from 3D game environments.
10. Examine the critical elements of puzzle design.
11. Evaluate the importance of iteration and rapid prototyping in game design.

3.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

3.B.1: COURSE OUTLINE

1. Introduction to game genres
 - a. Broad categories and distinguishing characteristics
 - b. Comparison of 2D and 3D game environments
 - c. Common environment mechanics, player views, and player controls
2. Overview of the key components of video game design
 - a. Game concept: description, platform, genre
 - b. Back story - world and character construction, emotion
 - c. Game Mechanics:
 - i. Rules: Operational, Constitutive, Implicit
 - ii. Game flow
 - iii. Gameplay
 - d. Game Balance
 - e. Goals and objectives
 - f. Rewards and motivation
 - g. Logic and challenges
 - h. Game physics and mathematics
 - i. Art/Sound
 - j. Resource Management
3. Introduction to rapid iteration and prototyping
4. Puzzle design (optional)

3.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

3.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

3.C.1.A: Exploring the Unity Editor

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 introduce learners to the importance of models and materials within the game development process and the tools available within 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*.

Models and Materials in Unity Editor:

<http://unity3d.com/learn/tutorials/modules/beginner/live-training-archive/models-and-materials>



3.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

3.C.2.A: Game Design Document (GDD) Entry



1

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.

2

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.

3

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!



3.C.2.B: Management for the Game Developer Assignment

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)*.

3.C.2.C: Contemporary Game Assignment

1

Document the primary 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.



2

Play: <http://www.games.jocuri-unity3d.com/after-sunset-2-unity-3d.html>.

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 intuitive 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.

3

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?

4

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)



5

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/it.
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.

3.C.2.D: 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.



3.C.2.E: One Button Game Assignment

Learners reference: http://www.gamasutra.com/view/feature/2316/one_button_games.php

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 Rules
5. Gameplay Mode
6. Setting
7. Challenges
8. Core Features in the Game: Clearly describe each feature and explain why it is important
9. Game Mechanics
 - a. Game Function Rules
 - b. Actions (i.e., what does the player need to do to tackle the challenges)
- c. Define the lives, ammo, money, health points, etc., in the game
- d. Explain how are they produced or obtained?
10. Game Balance:
 - a. Reward and punishment
 - b. Levels of difficulty
11. Victory Conditions:
 - a. How do you win the game? If there is no way to win the game, what is the player trying to accomplish?
 - b. How do you lose the game? (if applicable)



3.D: STANDARDS ALIGNMENT GUIDE

3.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ Identify the primary steps in the design process (Conceptualize, Prototype, Test, Analyze).
- ⇒ Explain the role of iteration in the design process.
- ⇒ Explain the difference between game mechanics and gameplay.
- ⇒ 1.1.12. Evaluate and describe various 2D & 3D, single & multi-user genre.
- ⇒ 1.2.8. Describe the difference between goals and objectives.
- ⇒ 1.6.2. Demonstrate understanding and ability to use game mechanics to improve gameplay.

3.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.RST.11-12.9](#) Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- ⇒ [CCSS.ELA-Literacy.CCRA.R.10](#) Read and comprehend complex literary and informational texts independently and proficiently.
- ⇒ [CCSS.ELA-Literacy.W.11-12.2](#) Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- ⇒ [CCSS.ELA-Literacy.W.11-12.7](#) Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

3.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC01 ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.



3:D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Creativity and Innovation
 - Think Creatively
 - Implement Innovations
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
- ⇒ Life and Career Skills
 - Initiative and self-direction
 - Manage Goals and Time
 - Work Independently
 - Be Self-Directed Learners

3.D.5: NEXT GENERATION SCIENCE STANDARDS (NGSS)

- ⇒ NGSS8: Obtaining, evaluating, and communicating information



3.E: ASSESSMENT REFERENCE GUIDE

3.E.1: Project Management for the Game Developer Assignment – Assessment Rubric

	Unacceptable	Basic	Proficient	Distinguished
Mechanics	Incomplete project steps and sequence.	Basic information and project plan is included, but limited details are provided for project charter.	Project details included on the charter with milestone targets and deliverables identified. The charter will guide the development of the Capstone Project effectively. The charter is very detailed in outcomes, and time frames; includes assumptions and objectives for the project.	Project details included on the charter with milestone targets and deliverables identified. The charter will guide the development of the Capstone Project effectively. The charter is very detailed in outcomes, and time frames; includes assumptions and objectives for the project.
Content (Thoroughness and Accuracy)	Incomplete information, poor objectives, milestones too broad or not measurable.	Project objectives are included, but are broad or unclear. Milestones are included, but are too broad.	Objectives clearly define targets for project completion. Milestones are reasonable for project size and scope. Project description clearly defines the project.	Project is very clearly defined and described. Objectives are clear and measurable, delineating specific project components and tasks. The milestones align to objectives and provide an achievable timeline leading to project completion. Milestones provide clear targets with key completion dates and content to guide and inform project progress and reporting requirements.
Completeness (quality of content)	Incomplete information provided.	Charter is completed, but lacks some key information or accurate information.	Charter is properly completed, but may have a few errors such as identifying stakeholders correctly, specification of timelines for milestones, or proper sequencing of activities.	Charter is very well thought out in terms of sequencing of events. Milestones include date projections, reporting requirements, and time estimates; all of which are reasonable. Assumptions clarify risks and factors that may affect project completion. Objectives are sequential and accurate for specification of project requirements and deliverables.
Technical: spelling, grammar, punctuation	Paper has many (e.g. >10) errors.	Assignment has several (e.g. 5-9) errors.	Assignment is proofread well, but has a few (e.g. 3-5) errors.	Assignment has been thoroughly proofread and contains little to no (e.g. 1-2) errors.

3.E: ASSESSMENT REFERENCE GUIDE

3.E.2: Contemporary Game Assignment – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Genre Identification	Genre is correctly identified along with sub-genre. No alternative genres proposed. No support for choice of genre.	Genre is correctly identified along with sub-genre. A single appropriate possibility for alternative genre classifications is suggested. Text is organized and aligned with the choice of genre.	Genre is correctly identified along with sub-genre. A single appropriate possibility for alternative genre classifications is suggested. Text is organized and aligned with the choice of genre.	Genre is correctly identified along with sub-genre. At least two appropriate possibilities for alternative genre classifications are suggested. Text is clearly crafted to support choice of genre.
Audience Description	Incorrectly identifies intended audience.	Identifies intended audience but provides no support for decision.	Identifies intended audience and text is aligned with choice.	Clearly identifies intended audience and text is crafted to support identification.
Goals and objectives	Goals are vague and/or incomplete.	Goals and objectives are partially identified but not stated such that a player understand how to play the game.	Most goals and objectives are identified so that a player could successfully play the game.	Goals and objectives are clearly stated and describe what a player must do to win the game.
Narrative description	Does not clearly describe game story.	Describes game story but does not provide any information on characters.	Clearly describes the game story, the idea behind the game, and identifies major characters in one or two sentences.	Clearly describes the game story, the idea behind the game, and identifies major characters submitting at least 6 sentences.
Overall game	Does not clearly address one or more of the following: graphics, playability, entertainment value.	Provides a brief description of the graphics used in the game. Describes the controls of the game but does not go into detail regarding usage. Addresses fun level but no regard to replay-ability.	Provides an adequate description of the graphics used in the game. Clearly describes the controls of the game with respect to ease or difficulty of use. Succinctly describes the entertainment value of the game with respect to fun and replay-ability.	Provides a vivid description of the graphics used in the game. Clearly describes the controls of the game with respect to ease or difficulty of use. Thoroughly describes the entertainment value of the game with respect to fun and replay-ability.
Technical: spelling, grammar, punctuation	Paper has many (e.g. >10) errors.	Assignment has several (e.g. 5-9) errors.	Assignment is proofread well, but has a few (e.g. 3-5) errors.	Assignment has been thoroughly proofread and contains little to no (e.g. 1-2) errors.

3.E.3: ASSESSMENT OF LEARNING OBJECTIVES

1. Supplied with a list of video game descriptions, the learner will be able to identify the correct genre(s).
2. Supplied with a list of gameplay characteristics, the learner will be able to categorize each characteristic within its appropriate game genre.
3. Upon request, the learner will be able to verbally summarize the important considerations in contemporary game design.
4. Following the *Rules on Three Levels* assignment, the learner will be able to identify, summarize, and interpret the implicit, operational, and constitutive rules of several contemporary video games within a written document.
5. Within a written document, the learner will be able to explain the 11 basic psychological needs that people can meet by playing video games.
6. Using the Unity Editor, the learner will be able to create models and materials (per technical guidelines set by the instructor) within the confines of the Unity Editor training assignments.
7. Supplied with a *Project Charter Form (PCF)*, learners will be able to integrate the principles of project management toward the completion of a basic project charter for their *Capstone Project*.
8. Within a written document, the learner will be able to create a game proposal for a one button game.
9. Within live, small group settings, learners will be able to communicate the difference between top-down 2D game environments and ground-up 3D game environments; citing contemporary examples as necessary to illustrate key points of differentiation.
10. The learner will be able to compose a written analysis of puzzle design; categorizing and contrasting popular, contemporary puzzle examples and debating the quality and effectiveness (i.e. good vs. bad) of puzzle design products in the market.
11. Supplied with a complete review of several contemporary games, learners will be able to evaluate (in writing) the role and importance of rapid prototyping and iteration with the game production process, citing specific examples for each game. Within live, small-group environments, the learner will also be able to select a game and judge the importance of iteration and rapid prototyping within the production process, defending their statements and debating opposing views.

3.F: SUGGESTED RESOURCES

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

1. An exhaustive list of game genres and sub-genres: <http://www.allgame.com/genres.php>
2. The Art of Puzzle Design: <http://www.scottkim.com/thinkinggames/GDC00/bates.html>.
This paper looks at the different types of puzzles, what distinguishes good design from bad, how to adjust the level of difficulty, and how to use puzzles to enhance the storyline of the game.
3. The Strategy Game Designer's Constitution: http://www.gamedev.net/page/resources/_/creative/game-design/the-strategy-game-designers-constitution-2758.
This document contains “golden rules” for design, interesting game mechanics to consider for your games, and a thought-provoking list of potential victory and ending conditions.
4. http://www.leiavoia.net/pages/docs/Strategy_Game_Designers_Cheatsheet.pdf
5. I Have No Words & I Must Design <http://www.rpg.net/oracle/essays/nnowords.html>
(note this link contains minor profanity which has been removed from the pdf provided in teacher resources.)



UNIT 4: STORY AND GAME CREATION



UNIT 4: STORY AND GAME CREATION

- 4.A: Unit Overview
- 4.B: Instructional Resource Guide
- 4.C: Learning Activities Guide
- 4.D: Standards Alignment Guide
- 4.E: Assessment Reference Guide
- 4.F: Suggested Resources

4.A: UNIT OVERVIEW

4.A.1: UNIT DESCRIPTION



This unit of study introduces the learners to the major elements of narrative for interactive environments. The focus is on the concepts of storytelling in relationship to game design. Learners will explore the fundamentals of narrative creation and the crucial importance of interactive storytelling. Learners will also use storyboards to create a visual sequence of story development and game play.

4.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Storytelling (e.g. theme, genre, tone)
- Character development (e.g. archetypes, personality traits, player and non-player characters)
- Storyboards (e.g. pre-visualization of scene flow, interactive sequencing)
- Environment development (e.g. terrain creation)
- Documents associated with gameplay storytelling (e.g. concept, story treatment, Game Design Document (GDD))

4.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

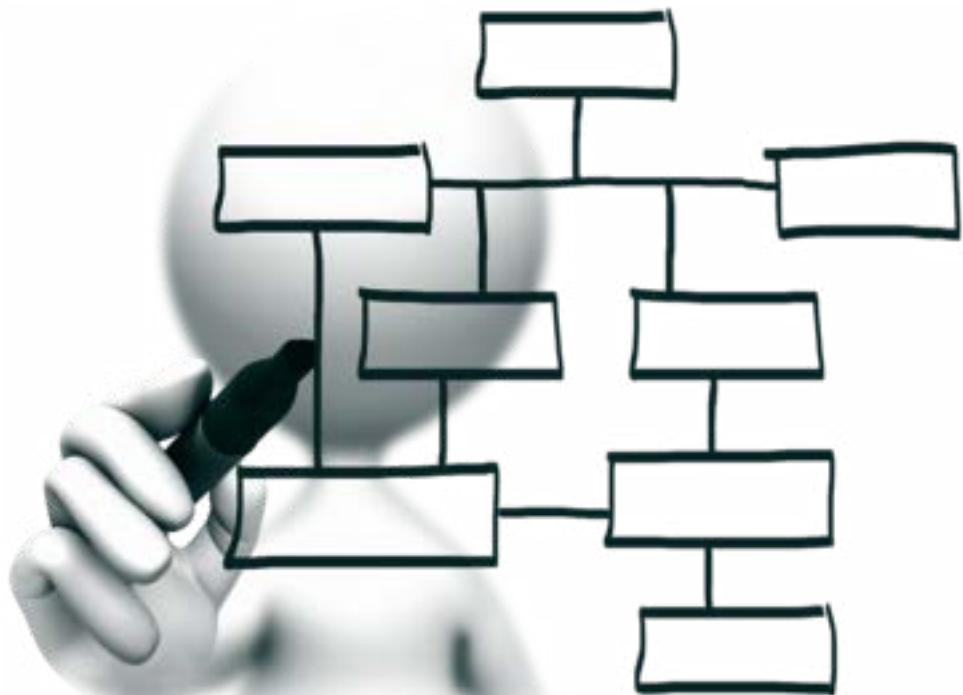
1. Deconstruct and review the general principles of storytelling
2. Explain the benefits of storytelling and the power of narrative
3. Describe the process of creating characters and designing character actions
4. Explain the use of storyboarding in game design
5. Identify the benefits of creating a storyboard
6. Create and control terrains within the Unity Editor
7. Explain how storyboard techniques can be used to further a storyline
8. Differentiate between the Concept Document, the Story Treatment Document, and the Game Design Document (GDD)
9. Distinguish components of a Work Breakdown Structure (WBS)

4.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

4.B.1: COURSE OUTLINE

1. What is a story? Introduction to storytelling principles
 - a. Story structure
 - b. Storyline
 - c. Conflict and drama
 - d. Types of narrative
2. Creating the characters for your story
 - a. Types of characters
 - b. Character archetypes
 - c. Character development elements
 - d. Visual development: appearance in the game
 - e. Verbal development: abilities, weakness and vulnerabilities, role in the game
 - f. Character backstory
3. The importance of images in telling a story: storyboarding fundamentals
 - a. Why use a storyboard?
 - b. Use of sketches, text and technical instructions to provide thorough descriptions of video game levels, scenes, goals, etc
 - c. Impact of sequence of frames in a storyboard and how this affects the story
 - d. Cues that help a visual storyteller to communicate ideas



4.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

4.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

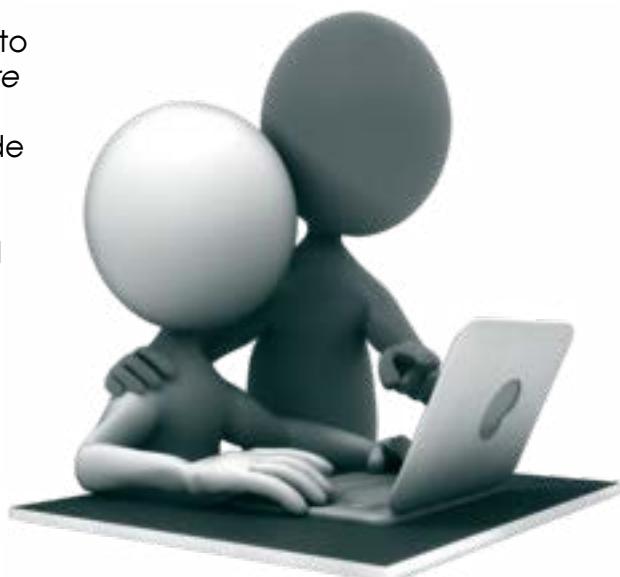
4.C.1.A: Exploring the Unity Editor

This tutorial below introduces the concepts of terrain and is a continuation of the development process for setting up a game build in the Unity Editor. This tutorial introduces the basic skills the learner will need to start any project in Unity. As learners finalize their game genre, story, and begin character development, the next tutorials will prepare them for bringing their storyboard to life within the Unity Editor. Provide time and opportunity for learners to complete the Terrain Sculpting Tutorial and previous tutorials as necessary to develop ability to begin the actual creation of their game for the *Capstone Project*.

Terrain Sculpting: <http://unity3d.com/learn/tutorials/modules/beginner/live-training-archive/terrain-sculpting>

4.C.1.B: 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.



4.C.1.C: Group Story Generation Exercise

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.

4.C.1.D: Consider this Image Exercise

Based on this image alone, create a 350-500 word story that includes the scene depicted below. Discuss what happened to bring the character to this point. How did the fish get into the scene? What happens after this scene? You are creating the backstory, as well as the future story.



4.C.1.E: Five Card Flicker Exercise

Based on the Five Card Nancy card game, by [Scott McLeod](#), Five Card Flickr is an exercise in visual storytelling. Players are dealt five random images from a [Flickr](#) tag (*Instructor note: You must set up the Flicker images and the tag to ensure learners do not choose inappropriate images*) or by using this link <http://5card.cogdogblog.com//play.php?suit=etmooc>. Repeat this process four more times, building a coherent storyline from your five photos, during each round.

4.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

4.C.2.A: Game Design Document (GDD) Entry



1

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.

2

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.

3

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.

4.C.2.B: Contemporary Game Assignment

1

Using this link, <http://www.games.jocuri-unity3d.com/minotaur-labyrinth-unity-3d.html>, watch the initial cut scene in the game: Minotaur Labyrinth. Then, pause the game. Discuss how the initial cut scene sets the stage for gameplay. What kind of mood does the story create? Based on the story, what do you expect from gameplay? What type of environment do you anticipate? What kind of challenges.

2

Now play the game: Minotaur Labyrinth. Explain how the game fits in with your expectations based on the initial backstory created via the cut scene. How would you have done the intro scene differently?



4.C.2.C: Critical Thinking Assignments

1

Write a short story about a character that is lost. You can choose the setting: woods, city, mall, etc. What does the setting look like? What is your character like? Physically? Personality wise? Where did the character come from? How did your character get lost? What does your character hear? Smell? Think? Feel? Who does your character talk to or with whom does your character interact? How does the problem in the story develop and resolve? Does the drama end in tragedy or comedy?

2

Create a storyboard that visually communicates your short story. Sketch out the scenes, character(s) and major objects. From sketch-to-sketch, include scenes, actions and transitions that detail the flow of the story. To enhance the communication value of the sketched panels, add titles and notations to detail any key sounds and special effects.

3

Write a 150-200 word essay explaining the butterfly effect. Then watch the short film "The Butterfly Effect" (found at <http://unity3d.com/pages/butterfly>), created by Unity Technologies and Passion Pictures. How is this film related to the butterfly effect? Discuss the elements used by the creators to generate the feelings and emotions engendered by the film. What was the "feel" at the beginning of the film? What techniques did the creators use to change that to the feeling of the film after the point where the main character encounters the skateboard?



4.D: STANDARDS ALIGNMENT GUIDE

4.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 1.1.8. Investigate the concept of “Interactive Narrative” and explain how it could pertain to game design.
- ⇒ 1.1.10. Determine the relevance of character development, backstory and attributes (power, speed, intelligence, empathy, etc.) in game design.
- ⇒ 1.3.1. Use appropriate, accurate terminology when communicating about artistic concepts and technology.
- ⇒ 1.3.2. Write effectively, producing clear, correct, & coherent prose adapted to purpose and audience.
- ⇒ 1.3.13. Assemble sketches & annotations into storyboards and presentations for both print and web.
- ⇒ 1.3.14. Create a narrative & storyboard for a new interactive app/video game.
- ⇒ 2.3.10. Explain what differentiates characters from other objects.

4.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.W.11-12.2](#) Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- ⇒ [CCSS.ELA-Literacy.W.11-12.3](#) Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
- ⇒ [CCSS.ELA-Literacy.W.11-12.4](#) Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- ⇒ [CCSS.ELA-Literacy.W.11-12.5](#) Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- ⇒ [CCSS.ELA-Literacy.W.11-12.6](#) Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
- ⇒ [CCSS.ELA-Literacy.W.11-12.10](#) Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

4.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
- ⇒ SCC04 INFORMATION TECHNOLOGY APPLICATIONS: Use information technology tools specific to the career cluster to access, manage, integrate, and create information.
- ⇒ SCC07 LEADERSHIP AND TEAMWORK: Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

4.D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Creativity and Innovation
 - Think Creatively
 - Work Creatively with Others
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
 - Collaborate with Others
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
 - Use and Manage Information
 - ICT (Information, Communications and Technology) LITERACY
 - Apply Technology Effectively
- ⇒ Life and Career Skills
 - Initiative and self-direction
 - Manage Goals and Time
 - Work Independently
 - Be Self-Directed Learners
 - Productivity and Accountability
 - Manage Projects
 - Produce Results

4.D.5: NEXT GENERATION SCIENCE STANDARDS (NGSS)

- ⇒ NGSS8: Obtaining, evaluating, and communicating information



4.E: ASSESSMENT REFERENCE GUIDE

4.E.1: Work Breakdown Structure (WBS) – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Work Breakdown Structure Components	Incomplete project steps and sequence.	Limited project steps and limited sequencing errors.	Project details identified on the charter by correct level of effort, WBS Code and descriptions to enable delivery of project to meet identified milestones.	The WBS is very accurate and complete with in depth levels and codes that clearly delineate all tasks to be completed. Descriptions are well thought out and clearly articulates tasks.
Completeness (quality of content)	Incomplete information provided.	WBS is completed, but lacks some key information or has errors such as inaccurate levels or WBS codes, Element Identification and definition.	WBS is properly completed but may have a few minor errors such as inaccurate levels or WBS codes, Element Identification and definition.	WBS is very well thought out in terms of sequence of events. Levels of work are very accurate and well thought out. The specific elements are very accurate in terms of major tasks to be completed in a measured block. Definitions are very clear and provide specific deliverables for each Element and Level.
Mechanics: spelling, grammar, punctuation	Paper has 7 or more errors.	Assignment has between 5 and 6 errors.	Assignment is proofread well, with only 3 or 4 errors.	Assignment has been thoroughly proof-read with no more than 2 errors.
Accuracy of Elements	Elements are vague and/or incomplete.	Elements are partially identified, but not stated such that a developer understands what is to be completed.	Most elements are identified so that a developer could successfully create the game.	Elements are clearly stated and are specific and sized right to describe what a developer must to do to schedule and create the project.

4.E: ASSESSMENT REFERENCE GUIDE

4.E.2: Story Writing – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Story Idea	The idea for the story needs work. Message is unclear.	The idea for the story was good. Message fairly clear.	The idea for the story was very good. Message very clear.	The idea for the story was excellent. Message extremely clear.
Characters	Characters are vague—more effort required. Characters' suitability to the storyline is unclear. Difficult to identify main characters. Very little description.	Characters are interesting—good effort. Characters are suitable to storyline. Main characters are named, but not described well (through words and/or images).	Characters are very interesting—very good effort. Characters are very suitable to storyline. Main characters are named and clearly described (through words and/or images).	Characters are extremely interesting—excellent effort. Characters are extremely suitable to storyline. Main characters are named and very clearly described (through words and/or images).
Setting	The reader has trouble figuring out when and where the story took place. Very little use of descriptive detail.	The reader can figure out when and where the story took place, but the author didn't supply much detail.	Some vivid, descriptive words are used to describe when and where the story takes place.	Many vivid, descriptive words are used to tell when and where the story takes place.
Problem/ Conflict	It is not clear what problem the main characters face.	It is fairly easy for the reader to understand the problem the main characters face, but it is not clear why it is a problem.	It is fairly easy for the reader to understand the problem the main characters face and why it is a problem.	It is very easy for the reader to understand the problem the main characters face and why it is a problem.
Creativity	There is little evidence of creativity in the story. The author does not seem to have used much imagination.	The story contains a few creative details and/or descriptions, but they distract from the story. The author has tried to use his imagination.	The story contains a few creative details and/or descriptions that contribute to the reader's enjoyment. The author has used his imagination.	The story contains many creative details and/or descriptions that contribute to the reader's enjoyment. The author has really used his imagination.

4.E: ASSESSMENT REFERENCE GUIDE

4.E.3: Character Creation Rubric – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Character creation and development	Shows little or no evidence of character creation. Reader could not pick the character out of a crowd.	Describes certain characteristics about the character, but leaves the readers feeling a little vague.	Establishes a believable character that is knowable and real, but some things are missing in the description.	Creates a believable and fully developed character. Reader feels like they know the character.
Character Attributes	Communication of character attributes is awkward and not fully developed.	Clearly describes at least two major character attributes (physical, mental, or emotional).	Clearly describes at least three major character attributes (physical, mental, or emotional).	Clearly portrays at least four or more major character attributes (physical, mental, or emotional), and maintains specific traits throughout.
Originality	Bases ideas on other's games or stories (does not give credit), but there is little or no evidence of original thinking.	Bases Ideas on other's games or stories (giving them credit), but there is little evidence of original thinking.	Character shows some original thought. Characteristics and traits are creative and inventive. Descriptions show new insights and ideas.	Character shows a large amount of original thought. Characteristics and traits are creative and inventive.

4.E.4: Storyboard Rubric – Assessment Rubric

	Unacceptable	Basic	Proficient	Distinguished
Storyboard Required Elements	Storyboard not done or is incomplete. Not suitable even as general guide. Very little evidence if any of planning of the visuals.	Large omissions in scene planning. Some sketches with notes and other information. Effective planning of visuals.	Relatively complete with sketches for most scenes. Titles, notes, transitions and other information provided for all scenes. Good planning and organization of visuals.	Sketches for all scenes. Titles, detailed notes, transitions, special effects, sound all described. Shows excellent planning and organization of visual details.

4.E.5: ASSESSMENT OF LEARNING OBJECTIVES

1. Given a brief storyline, the learner will create character profiles of the protagonist and antagonist.
2. Given a set of character descriptions, the learner will be able to categorize the archetype.
3. Given a specific archetype, the learner will be able to summarize the characteristics and typical function within the storyline.
4. Given an image, the learner will be able to create an original character for use in a story.
5. The learner will be able to summarize at least three functions of storyboards and how they communicate information to the audience.
6. The learner will begin to experience the process of creating characters and stories.
7. The learner will begin the process of creating environments (e.g. terrains) utilizing the Unity Editor.
8. Given a short story, the learner will be able to create a storyboard to communicate a visual depiction of the storyline.
9. The learner will estimate the time and activities required to complete an accurate *Work Breakdown Structure (WBS)* as part of applying project management techniques to completion of the *Capstone Project*.

4.F: SUGGESTED RESOURCES

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

1. The 7 keys of storytelling <https://www.youtube.com/watch?v=hVcg9L6FLPA>
2. A List of Character Archetypes (pdf)
3. Methods of Characterization worksheet (pdf)
4. Just Enough Project Management Text: <http://www.amazon.com/Just-Enough-Project-Management-Indispensable/dp/0071445404> and for download: http://ebookee.org/Just-Enough-Project-Management_3617.html
5. Guide for Creating a Work Breakdown Structure: <https://www.workbreakdownstructure.com/>
6. Templates for WBS Creation: <https://www.workbreakdownstructure.com/>



UNIT 5: SYSTEM DYNAMICS AND SCRIPTING FUNDAMENTALS



UNIT 5: SYSTEM DYNAMICS AND SCRIPTING FUNDAMENTALS

- 5.A: Unit Overview
- 5.B: Instructional Resource Guide
- 5.C: Learning Activities Guide
- 5.D: Standards Alignment Guide
- 5.E: Assessment Reference Guide
- 5.F: Suggested Resources

5.A: UNIT OVERVIEW

5.A.1: UNIT DESCRIPTION



The focus of this unit of study is to introduce learners to the concepts of system thinking. Learners will begin to understand the interdependent elements of game design. Learners will also recognize the need for game documentation requirements and explore concepts in scripting.

5.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Components of a Game Development Plan (e.g. System Thinking, Game Documentation)
- System Design (e.g. Functional Components, Flow Charts)
- Anatomy of Creating Scripts (e.g. Class, Declarations, Contents, Event Sequencing, Variables, Operators, Conditionals, Programming/Scripting languages)

5.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

1. Define the components of the design and problem solving process
2. Describe the system model as related to game development
3. Create script(s) to perform an action in a game
4. Create a basic script and attach it to one or more game objects
5. Populate properties with values or other game objects
6. Create a bug tracking list for software applications
7. Analyze the sequencing of game actions
8. Differentiate contemporary scripting languages
9. Sequence events by writing variables, operators, and conditionals within a script
10. Evaluate the anatomy of a script
11. Critique Game Design Documents (GDD)

5.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

5.B.1: COURSE OUTLINE

1. Components of a Game Design Document (GDD):
 - a. System Thinking and System Awareness
 - b. Design for Game Development
 - c. Establishing the Game Purpose
 - d. Identifying the Audience and Understanding the Player
 - e. Goals and Objectives for Games
 - f. Creating the Game Script and Narrative
2. System Thinking and Design
 - a. Using the Script and Storyboard
 - b. Sequences and Triggers
 - c. Flowcharting the Player Process
 - d. Creating a Complete Game Design Document (GDD)
3. Languages
 - a. A comparison of programming languages
 - b. Choosing a language: programming versus scripting
 - c. Common languages: Strengths and Weaknesses
4. Anatomy of Creating Scripts:
 - a. Class
 - b. Declarations
 - c. Event Sequencing
 - d. Variables
 - e. Operators
 - f. Conditionals
 - g. Troubleshooting and bug tracking



5.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

5.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

5.C.1.A: Learner Scripting Skills - Assignment

This tutorial section covers the basic coding skills required to create a good game. By this Unit, learners should have experience in the import and setup of objects/models in the Unity Editor. Now, they need to develop the skill of writing scripts that cause actions to occur in the game, beyond the basic functions. Learners should complete the following tutorials:

1. Spinning Cube: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/assignments/spinning-cube>
2. Simple Clock: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/simple-clock>

5.C.1.B: Building Learner Scripting Skills - Extended Assignment

The tutorials listed below address basic commands within a game. In this assignment, learners will develop their skills and broaden their understanding of creating and writing scripts used to run and manage the games they create. Learners should complete the following tutorials:

1. Scripts as Behavior Components: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/scripts-as-behaviour-components>
2. Variables and Functions: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/variables-and-functions>
3. Conventions and Syntax: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/conventions-and-syntax>
4. C# vs JS syntax: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/c-sharp-vs-javascript-syntax>
5. IF statements: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/if-statements>
6. Loops: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/loops>
7. Classes: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/classes>



5.C.1.C: 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. Optional activities can include learner group review of a game sequence and the completion of a “what if” scenario for any changes they try to implement.

5.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

5.C.2.A: 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.

5.C.2.B: 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.

5.C.2.C: Bug Report

Using bug tracking software of your choice, you will enter a bug report for any bugs created or encountered as you begin learning to code. As you repair bugs, create a *Bug Tracking List* and add it to the *Game Developers Journal*. Enter the solutions into the bug tracking database. The Bug Tracking List should be part of your final deliverables.



5.D: STANDARDS ALIGNMENT GUIDE

5.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 1.2.2. Develop problem statements and design briefs.
- ⇒ 1.2.3. Describe problem-solving processes and their application.
- ⇒ 1.2.4. Develop specifications (criteria and constraints) to optimize solutions.
- ⇒ 1.2.12. Sequence objectives and tasks logically.
- ⇒ 1.2.13. Explain and demonstrate project management techniques.
- ⇒ 1.3.1. Identify and apply appropriate, accurate terminology when communicating about artistic concepts and technology.
- ⇒ 1.3.5. Develop, analyze and communicate design ideas using annotated sketches, technical drawings, graphical, mathematical and/or physical models.
- ⇒ 1.3.8. Apply brainstorming techniques to creatively generate a multitude of possible solutions to a stated problem.
- ⇒ 1.3.14. Create a narrative & storyboard for a new interactive app/video game.
- ⇒ 1.8.4. Create, iterate and maintain a full set of game design documentation.
- ⇒ Demonstrate an understanding of mathematical concepts, logic and syntax shared by various programming languages.
- ⇒ Demonstrate an understanding of “if” and “switch” statements.
- ⇒ Demonstrate an understanding of loops to manage recurring events.
- ⇒ Demonstrate an understanding of co-routines.
- ⇒ Demonstrate an understanding of Functions, Constants and Variables.
- ⇒ Declare and update Fields and Properties with varied access modifiers.
- ⇒ 2.7.9. Demonstrate an understanding of proper use of Classes and Functions.

5.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.RST.9-10.1](#) Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- ⇒ [CCSS.ELA-Literacy.RST.9-10.3](#) Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- ⇒ [CCSS.ELA-Literacy.RST.11-12.3](#) Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- ⇒ [CCSS.ELA-Literacy.RST.11-12.6](#) Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
- ⇒ [CCSS.ELA-Literacy.RST.11-12.9](#) Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

5.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC01 ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.

5.D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Creativity and Innovation
 - Think Creatively
 - Implement Innovations
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
- ⇒ Life and Career Skills
 - Initiative and self-direction
 - Manage Goals and Time
 - Work Independently
 - Be Self-Directed Learners

5.D.5: NEXT GENERATION SCIENCE STANDARDS (NGSS)

- ⇒ NGSS1: Asking questions (for science) and defining problems (for engineering)
- ⇒ NGSS8: Obtaining, evaluating, and communicating information



5.E: ASSESSMENT REFERENCE GUIDE

5.E.1: Game Development Plan – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Sequencing	Flowchart does not capture all sequences that would allow the game to work correctly.	Flowchart captures broad actions that would allow the game to work, but may provide limited information necessary to help the developer build directly from the chart.	Flowchart properly sequences all events that occur and accurately branches based on inputs and outputs of the systems. Includes feedback loops and identifies triggers and events for all actions in the game.	Flowchart properly sequences all events and all branches, triggers and outputs. Flowchart clearly shows all major and sub category actions to specific detail. Flowchart is easy to follow and signals all the game actions.
Accuracy/ Logic	Flowchart has multiple flaws, missing links, or outputs that do not work.	Flowchart is accurate, but limited in terms of depth. Flowchart may have some outputs that are incomplete or dead end.	Flowchart accurately guides development process and all branches work. However, a few missing steps or logic errors may be present.	Flowchart captures all sequences, events, triggers and actions to completely build the game. No broken links, dead ends or logic errors exist.
Appearance	Flowchart is overly complex, disorganized, and/or difficult to read.	Flowchart is simple and basic. Limited use of graphics within the chart.	Flowchart is spaced nicely, uses graphic images appropriately, and is easy to follow.	Flowchart is very well spaced, good use of graphic images, colors, line weights. Flowchart uses section titles and is very easy to read and follow.

5.E.2: ASSESSMENT OF LEARNING OBJECTIVES

1. In writing, the learner will be able to summarize, in detail, the components of the design and problem solving process.
2. The learner will be able to diagram a “system model” that clearly depicts the game development process and interdependence of game components.
3. Within the Unity Editor, learners are able to create simple script(s) to perform specific actions in a game.
4. Within the Unity Editor, learners are able to populate properties with values or other game objects.
5. Learners will create basic structures for discrete code functions to a success rate of 100% accuracy as demonstrated by fully functioning code.
6. Using bug tracking software, learners are able to create a *Bug Tracking List*.
7. When provided with several examples, learners are able to effectively analyze the sequencing of game actions.
8. When provided code samples, learners are able to compare, contrast, and ultimately identify common scripting languages.
9. Using a contemporary language, learners are able to sequence events by writing variables, operators, and conditionals within a script.
10. Within a guided session, learners will be able to assess and judge the significance of specific scripts used in simple games.
11. When provided samples, learners will be able to critique the completeness of a *Game Design Document (GDD)* for a simple interactive application or video game.

5.F: SUGGESTED RESOURCES

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

1. Resource for Sample Flowchart and Game Design: <http://xbox.create.msdn.com/en-US/education/tutorial/2dgame/design>
2. Resource for Sample Flowchart and Game Design: Teach Games: Game design and development resources for educators: <http://teachgames.wordpress.com/tag/flowchart/>
3. *The Ultimate Guide to Video Game Writing and Design*, Dille, Flint
4. *Writing for Video Game Genres: From FPS to RPG*, Despain, Wendy
5. Video Game Design/Design: http://en.wikibooks.org/wiki/Video_Game_Design/Design

Resource for Additional Scripting Training

1. Great Resource for Quick Script/code Introduction: Unity Game Development in 24 Hours, Sams Teach Yourself: <http://www.amazon.com/Unity-Development-Hours-Teach-Yourself/dp/0672336960>, Mike Geig
2. Scripting: <http://unity3d.com/learn/tutorials/modules/beginner/scripting>
3. Learn C# scripting in Unity: <http://www.catlikecoding.com/unity/tutorials/>
4. Unity3Dstudent: <http://www.unity3dstudent.com/tag/scripting/>



UNIT 6: GAME DEVELOPMENT TOOLS, FUNCTIONS, AND PROPERTIES



UNIT 6: GAME DEVELOPMENT TOOLS, FUNCTIONS, AND PROPERTIES

- 6.A: Unit Overview
- 6.B: Instructional Resource Guide
- 6.C: Learning Activities Guide
- 6.D: Standards Alignment Guide
- 6.E: Assessment Reference Guide
- 6.F: Suggested Resources

6.A: UNIT OVERVIEW

6.A.1: UNIT DESCRIPTION

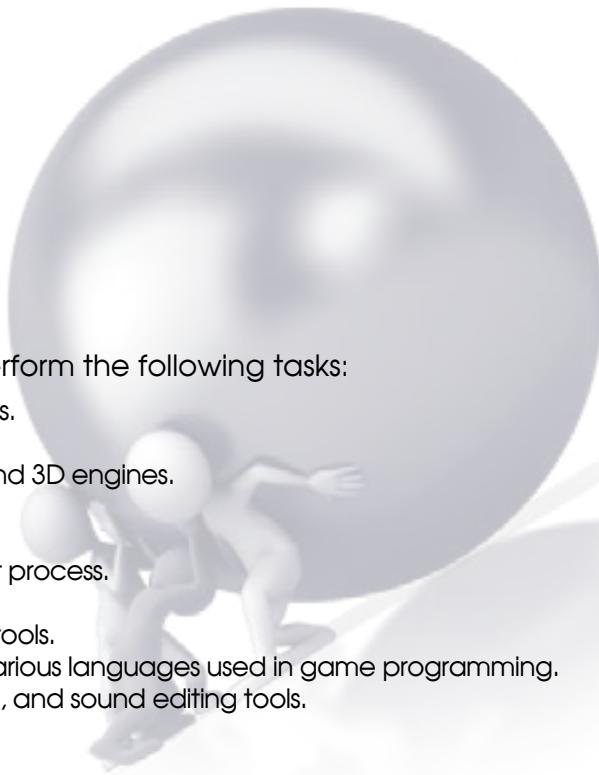


Activities in this unit of study are constructed to facilitate the design, development, and analysis of existing tools used for game development. This unit will explore software selection, language selection, and technical tools used in the creation of interactive applications and video games.

6.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Middleware and 3D engines
- Level editors (e.g. Unity Editor)
- Physics engines (e.g. PhysX)
- Sound editing tools
- Dynamic libraries



6.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

1. Explain the function and purpose of physics engines.
2. Identify contemporary game development tools.
3. Explain the function and purpose of middleware and 3D engines.
4. Explain the function and purpose of level editors.
5. Write scripts that perform specific functions.
6. Apply vector math within the project development process.
7. Explain the purpose of dynamic libraries.
8. Explain the function and purpose of sound editing tools.
9. Evaluate the advantages and disadvantages of various languages used in game programming.
10. Evaluate middleware, level editors, graphics, video, and sound editing tools.

6.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

6.B.1: COURSE OUTLINE

1. Gaming Engines
 - a. What is a game engine?
 - b. Middleware
 - c. 3D engines
2. Resource development tools
 - a. Graphic file formats and editors
 - b. Video file formats and editors
 - c. Sound file formats and editors
 - d. Asset file formats
3. Level Editors
 - a. Function and purpose
 - b. In-game level editors
 - c. Popular level editors
4. Physics Engines
 - a. Collision detection
 - b. Dynamic simulation: rigid body and soft-body
5. Libraries
 - a. What is a software library: Purpose and examples
 - b. Dynamic versus Static



6.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

6.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

6.C.1.A: Exploring the Unity Editor

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*. The tutorials listed below provide additional hands-on learning experiences with the Unity Editor. They also provide skills that can be retroactively applied to the work already completed. Provide adequate time for learners to complete these tutorials as they cover key scripting topics.

1. Activating Game Objects: <http://unity3d.com/learn/tutorials/modules/scripting/activating-gameobjects>
2. Scope and Access Modifiers: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/variable-scope-and-access-modifiers>
3. Awake and Start: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/awake-and-start>
4. Update and FixedUpdate: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/update-and-fixedupdate>
5. Enabling and Disabling Components: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/enabling-disabling-components>
6. Translate and Rotate: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/translate-and-rotate>
7. Look At: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/look-at>
8. GetButton and GetKey: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/get-button-and-get-key>
9. Get Axis: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/get-axis>
10. OnMouseDown: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/on-mouse-down>
11. GetComponent: <http://unity3d.com/learn/tutorials/modules/beginner/scripting/getcomponent>





6.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

6.C.2.A: Game Design Document (GDD) Entry

In your Game Design Document (GDD), begin to list the tasks you will need to address as you develop your game, using Unity as your game editor and game engine.

- What types of libraries might you need?
- What external file formats might you use?
- Will your game have physics based interactions and, if so, are there any special needs you must take into account?
- Given that Unity supports multiple languages, which language will you use?

Make notes for yourself as to why you made these choices. This will help spark your memory at a later time.

6.C.2.B: Game Design Document (GDD)

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.



6.C.2.C: Other Activities

1

Watch: <https://unity3d.com/learn/tutorials/modules/beginner/2d/physics2d> as an introduction to game physics. Then complete this bouncing ball tutorial to understand how physics works in a gaming environment: <http://unity3d.com/learn/tutorials/modules/beginner/physics/assignments/bouncing-ball>

2

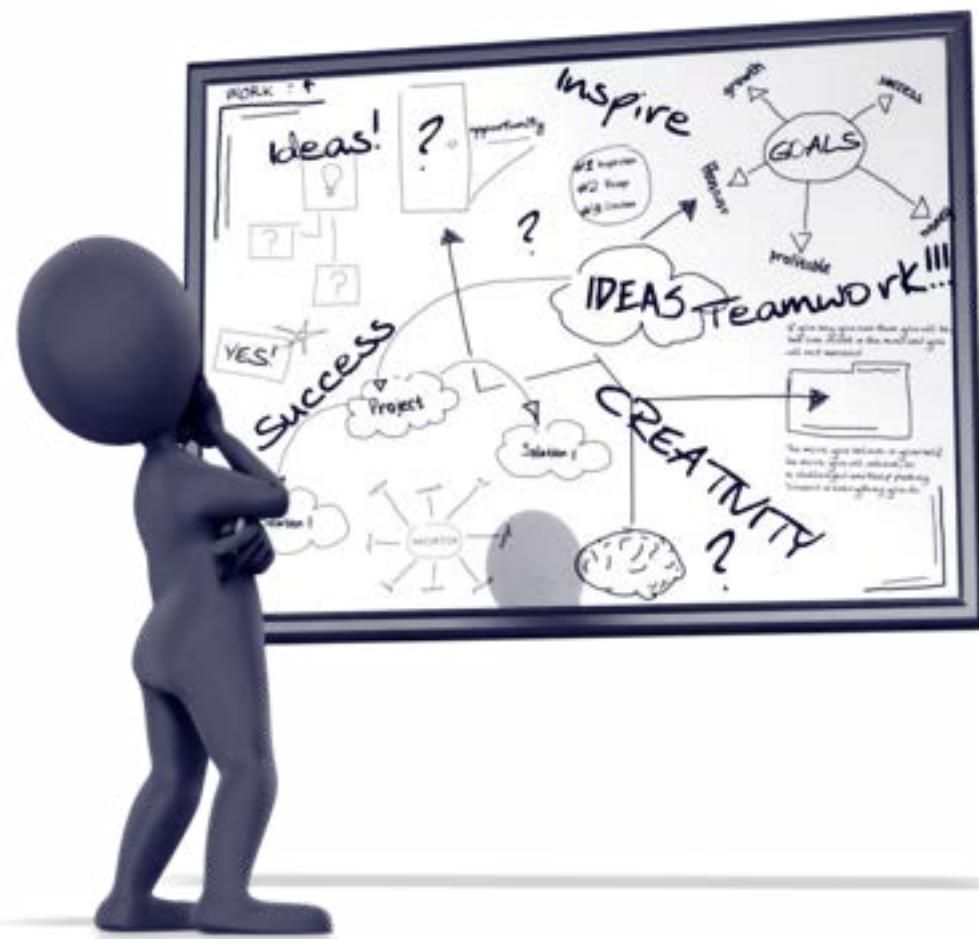
Complete the Physics Best Practices Tutorial found at: <http://unity3d.com/learn/tutorials/modules/intermediate/physics/physics-best-practices>

3

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).

4

Write a two page document discussing the important features to consider when selecting a level editor. Begin with an explanation of the purpose of a level editor and be sure to explain why the features you identify are important. Your document should follow regional guidelines and reference at least two external sources.



6.D: STANDARDS ALIGNMENT GUIDE

6.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 1.7.1. Assess and adapt technology tools and processes for producing deliverables that meet requirements and quality standards.
- ⇒ 1.7.9. Demonstrate a working knowledge of game development tools.
- ⇒ 1.7.12. Explain the usage of graphic files formats and file interoperability.
- ⇒ 1.7.13. Explain the usage of video files formats and file interoperability.
- ⇒ 1.7.14. Explain the usage of audio file formats and file interoperability.
- ⇒ 2.3.1. Import assets from appropriate file formats for use in development.
- ⇒ 2.7.13. Demonstrate an understanding of various programming interfaces.

6.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.RST.11-12.7](#) Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- ⇒ [CCSS.ELA-Literacy.RST.11-12.9](#) Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- ⇒ [CCSS.ELA-Literacy.RST.11-12.10](#) By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
- ⇒ [CCSS.ELA-Literacy.L.11-12.6](#) Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

6.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC01 ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
- ⇒ SCC04 INFORMATION TECHNOLOGY APPLICATIONS: Use information technology tools specific to the career cluster to access, manage, integrate, and create information.

6.D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
 - ICT (Information, Communications and Technology) LITERACY
 - Apply Technology Effectively
- ⇒ Life and Career Skills
 - Flexibility and adaptability
 - Be Flexible



6.E: ASSESSMENT REFERENCE GUIDE

6.E.1: Level Editor Assignment – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Features	Work lists three or less features and provides little or no explanations of the importance of the features.	Work clearly addresses at least three of the following features: compatibility, stability, expandability, modes and interfaces. Provides reasonable explanation of the importance of each of these features.	Work clearly addresses compatibility, stability, expandability, modes and interfaces. Provides thorough explanation of the importance of each of these features.	Work clearly addresses compatibility, stability, expandability, modes and interfaces. Provides thorough explanation of the importance of each of these features and offers examples of level editors which provide all the features.
References	No external sources used.	Provides only one external source.	Cites at least two external sources.	Cites three or more external sources.
Conventions, grammar, format	Insufficient understanding of material. Insufficient textual evidence. Multiple errors in arrangement, punctuation, and sentence structure. Incorrectly formatted or missing external references.	Adequate understanding of material. Insufficient textual evidence. Clear, but basic expression of ideas, little variation in sentence form; some errors at word and sentence level. Appropriate citations.	Good understanding of material. Sufficient, but predictable textual evidence. Conveys ideas with effective and varied sentence structure. Few errors at word and sentence level. Includes several appropriate citations.	Complete mastery of material. Assertions supported with well-chosen textual evidence. Presents ideas in well crafted, varied, engaging, virtually error-free sentences. Includes appropriate citations throughout.

6.E.2: ASSESSMENT OF LEARNING OBJECTIVES

1. Learners will be able to hypothesize several ways in which a physics engine might be used within a game.
2. The learner will be able to estimate the design impacts of adding physics to a game covering predictability, tuning and control, and emergent behaviors.
3. Learners will be able to discuss the principles of ray casting and explain why it is used.
4. The learner will be able to summarize the major features considered when selecting a level editor and defend the reasoning behind their feature selection.
5. The learner will be able to compare purposes of static and dynamic libraries and justify recommendations for the use of each in particular situations.
6. Learners will be able write scripts that Awake and start, update and will run FixedUpdatees within a given project development.
7. The learner will be able to write scripts that activate game objects and adjust scope and access modifiers within a given project development.
8. Learners will be able apply vector math within a given project development.
9. The learner will be able write scripts that enable and disable components within a given project development.
10. Learners will be able write scripts that translate and rotate objects based on specific criteria.

6.F: SUGGESTED RESOURCES

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

1. Global Directory of Game Engines and Middleware <http://www.gamemiddleware.org/>
2. History And Comparative Study Of Modern Game Engines <http://bipublication.com/files/IJCMS-V3I2-2012-07.pdf>
3. Top 14 game engines in 2013: <http://www.develop-online.net/news/the-top-14-game-engines-the-list-in-full/0114330>
4. What Level Editor and Game Engine Should You Use http://www.worldofleveldesign.com/categories/level_design_tutorials/what-level-editor-game-engine-should-you-use-how-to-choose.php
5. Good source of information for programming languages comparison, pros and cons: http://www.dmoz.org/Computers/Programming/Languages/Comparison_and_Review/
6. Great Resource for Quick Script/code and Animation: Unity Game Development in 24 Hours, Sams Teach Yourself: <http://www.amazon.com/Unity-Development-Hours-Teach-Yourself/dp/0672336960>, Mike Geig.



UNIT 7: INTERFACES, ENVIRONMENTS, ASSET MANAGEMENT, AND ANIMATION



UNIT 7: INTERFACES, ENVIRONMENTS, ASSET MANAGEMENT, AND ANIMATION

- 7.A: Unit Overview
- 7.B: Instructional Resource Guide
- 7.C: Learning Activities Guide
- 7.D: Standards Alignment Guide
- 7.E: Assessment Reference Guide
- 7.F: Suggested Resources

7.A: UNIT OVERVIEW

7.A.1: UNIT DESCRIPTION



Activities in this unit of study are designed to engage the learner, providing rich skill building opportunities in areas of game interface creation for Human Computer Interfaces and Graphical User Interfaces.

7.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Developing the Game Environment (e.g. object placement, terrains, environment effects, skyboxes, navigation, character controllers)
- Graphical and Human Interfaces (e.g. controls, skins, and styles)
- Creating Animations in Unity (e.g. preparing models, avatars, states, blend trees)

7.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

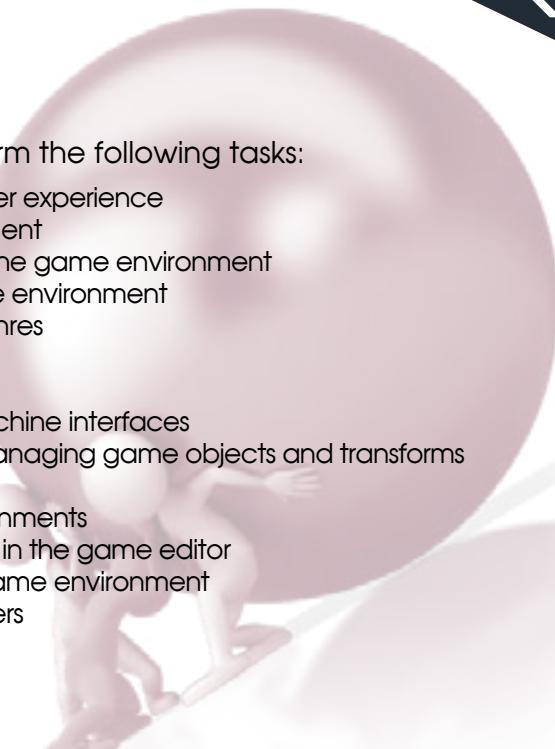
1. Structure the game environment to enhance the player experience
2. Place objects appropriately within the game environment
3. Integrate navigation and character controllers within the game environment
4. Apply terrain and environment effects within the game environment
5. Utilize game interfaces across platforms and game genres
6. Apply skins to game interfaces
7. Create quality game interfaces
8. Differentiate graphical user interfaces and human machine interfaces
9. Explain the importance of hierarchical structures for managing game objects and transforms within the game editor
10. Apply skyboxes to create dynamic game world environments
11. Manage object properties and object transformations in the game editor
12. Utilize world and local coordinate systems within the game environment
13. Create, manipulate, and transform animation controllers
14. Create animator components
15. Create blended animations using blend trees
16. Utilize scripts to manage animators

7.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

7.B.1: COURSE OUTLINE

1. Developing the Game Environment
 - a. Components of the Game Environment
 - b. Creating Terrain for Realism
 - c. Trees, Grass and Water
 - d. Environment Effects: Skyboxes, Fog, Lens Flares
 - e. Character Controllers
 - f. Fixing Your Virtual World
2. Graphical and Human Machine Interfaces
 - a. Basics of GUI and HMI Design
 - b. GUI and HMI Controls
 - c. Labels, Buttons, Toolbars, Toggles, and Other Controls
 - d. Styles and Skins
3. Creating Animations in Unity
 - a. Advanced Animations
 - b. Preparing Models for Animation



7.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

7.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES



7.C.1.A: Animation within an Interface

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. The following tutorials will help learners develop technical animation skills in Unity.

1. Animator Component and Game Objects:
<http://unity3d.com/learn/tutorials/modules/beginner/animation/animator-component>
2. Animator Controllers:
<http://unity3d.com/learn/tutorials/modules/beginner/animation/animator-controller>
3. Avatar Masks:
<http://unity3d.com/learn/tutorials/modules/beginner/animation/avatar-masks>
4. Animator Scripting:
<http://unity3d.com/learn/tutorials/modules/beginner/animation/animator-scripting>
5. The Animation View:
<http://unity3d.com/learn/tutorials/modules/beginner/animation/animation-view>
6. Animation Properties:
<http://unity3d.com/learn/tutorials/modules/beginner/animation/animation-properties>

7.C.1.B: 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.

7.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

7.C.2.A: Game Developers Journal Entry

Within your *Game Developers Journal*, enter at least five core game (i.e. product) ideas to be considered for your 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 your final *Capstone Project* submission.

1
2

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

3

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)*.

7.C.2.B: 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)*.

7.C.2.C: 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.



7.C.2.D: Interface Design Activity

In this activity, you will open several games of your choosing from this link:

<http://unity3d.com/showcase/gallery>.

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.

7.C.2.E: 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. The learners should practice using different GUI controls and change skins as they progress. 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, popups, 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.

7.C.2.F: Character Controllers

In this activity, learners will build a character controller to help them further understand interactions with objects in a scene. Have learners create and use the two default Character Controllers - “3rd Person Controller” and “First Person Controller” – in the Unity Editor by completing the following tutorial: <http://cgcookie.com/unity/2011/12/05/introduction-to-character-controllers/>



7.D: STANDARDS ALIGNMENT GUIDE

7.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 2.4.1. Implement environmental designs into 2D & 3D levels.
- ⇒ 2.4.2. Select appropriate models and materials for creating environments.
- ⇒ 2.4.3. Understand and use terrain generation and manipulation tools.
- ⇒ 2.4.4. Create, edit and enhance environments to optimize quality.
- ⇒ 2.4.5. Create and modify procedural effects like skyboxes, fog and lens flare.
- ⇒ 2.8.1. Explain and demonstrate principles of visual communication.
- ⇒ 2.8.2. Explain Cascading Information Theory as a game mechanic.
- ⇒ 2.8.3. Using examples, describe key principles behind graphical user interfaces (UIs).
- ⇒ 2.8.4. Define usability as a quality objective for user interfaces (UIs).
- ⇒ 2.8.4. Differentiate between diegetic and non-diegetic user interface elements.
- ⇒ 2.8.5. Explain how specific UI characteristics can affect usability.
- ⇒ 2.8.6. Determine the UI functionality required by a specific project to improve outcomes and meet the needs of users.
- ⇒ 2.8.7. Explain how target platform capabilities and constraints affect the choice of user interfaces.
- ⇒ 2.8.8. Apply structured methods to user interface development.
- ⇒ 2.8.9. Implement a new user interface system, test and evaluate its usability.
- ⇒ 2.8.10. Modify and adapt user interfaces for different target platforms & genre.



7.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ **CCSS.ELA-Literacy.RST.9-10.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- ⇒ **CCSS.ELA-Literacy.RST.9-10.3** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- ⇒ **CCSS.ELA-Literacy.RST.9-10.7** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- ⇒ **CCSS.ELA-Literacy.RST.9-10.10** By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.
- ⇒ **CCSS.ELA-Literacy.RST.11-12.3** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- ⇒ **CCSS.ELA-Literacy.RST.11-12.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

7.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC01 ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
- ⇒ SCC04 INFORMATION TECHNOLOGY APPLICATIONS: Use information technology tools specific to the career cluster to access, manage, integrate, and create information.

7:D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
 - Information Literacy
 - Apply Technology Effectively
- ⇒ Life and Career Skills
 - Flexibility and Adaptability

7.E: ASSESSMENT REFERENCE GUIDE

7.E.1: User Interface - Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Appearance	Interface is not user friendly, players cannot figure out how to start, stop, play, or move game objects. Colors and appearance are not appealing or do not provide good graphic appearance.	Interface is basically flat and traditional with buttons and a few prompts. Colors and appearance are workable, but not optimal for graphic quality. It is not clear how the game works from first appearance.	The interface has good realism and has appealing colors and textures. Good use of props, landscapes and textures to provide realistic looking experience.	The interface has high realism and creates a pleasing environment contextualized within the theme of the game. Effective use of props or landscapes to create a sense of being in-world in the game.
Functionality	Buttons, prompts, triggers or events do not work correctly.	Interface object functions work correctly. Issues with popups, buttons, etc. interfering with gameplay or are difficult to find.	All controls work as designed and player have no trouble finding correct triggers, devices, and tools that are required for gameplay. Some limited or awkward controls for access and application in the game.	All controls work and are well embedded in the interface in order to not impede gameplay. It is easy for player to grab game objects or operate triggers as required for gameplay.
Design	Design totally lacks thought-for placement of controls and how player's best interface with game. Low quality and limited effort displayed.	Interface design is just standard no real creativity to design, lacks enough controls, does not help engage player in game experience fully.	Interface design is solid and balanced to engage players in the playing of the game. The interface effectively manages game play and directions for players are clear and concise.	Controls are closely linked to game activities and blend extremely well into the game to not be a distraction to the action of the game. Very well built out design.
Creativity	Basic design is similar to older style interfaces.	Use of color, dropdowns or objects, but still basic in appearance.	Interface looks very much like game environment and triggers or events are generated within the game environment. Interface helps engage the player in the game experience as game controls exist in game environment or on object or as key strokes.	Very unique environment that fully engages the player in the game experience. All objects in the interface are part of the game not external such as a button, etc. Colors, textures and play space are very inviting and unique.

7.E.2: ASSESSMENT OF LEARNING OBJECTIVES

1. The learner will be able to differentiate a graphical user interface from a human machine interface.
2. Learners will be able to summarize the role and purpose of controls that are (or should be) included in a GUI/HMI.
3. Learners will be able to design and create a plan for interface controls to include in their own game or evaluate ways to improve an existing game.
4. The learner will accurately choose appropriate game assets and effectively assemble them into the game environment.
5. Learners will be able to apply proper asset management techniques, employ effective hierarchical strategies, and perform adequate asset transformations within specific game development projects.
6. The learner will be able to integrate animator controllers, animator components, and blend trees that meet the requirements of a given project.
7. Learners will be able to apply and manage humanoid avatars within the requirements of a given project.
8. The learner will be able to utilize animation curves, adjust animation properties and events (as necessary) to meet the requirements of a given project.
9. Learners will be able to write and execute animation scripts that meet specific project guidelines.
10. The learner will be able to evaluate effective from ineffective uses of interface controls.
11. Learners will be able write scripts that activate game objects and adjust scope and access modifiers within a given project.

7.F: SUGGESTED RESOURCES

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

1. Game UI Discoveries: What Players Want http://www.gamasutra.com/view/feature/4286/game_ui_discoveries_what_players_.php?print=1
2. Video game user interface design: Diegesis theory: <http://devmag.org.za/2011/02/02/video-game-user-interface-design-diegesis-theory/>
3. User interface design in video games: <http://www.thewanderlust.net/blog/2010/03/29/user-interface-design-in-video-games/>
4. Human-computer interaction: http://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction#Thirteen_principles_of_display_design
5. Game UI By Example: A Crash Course in the Good and the Bad: <http://gamedevelopment.tutsplus.com/tutorials/game-ui-by-example-a-crash-course-in-the-good-and-the-bad--gamedev-3943>
6. Cartesian Coordinate System: <http://www.shodor.org/interactivate1.9/lessons/cartesian.html>
7. Graphical User Interfaces: Unity Game Development in 24 Hours: <http://www.amazon.com/Unity-Development-Hours-Teach-Yourself/dp/0672336960>



UNIT 8: PHYSICS AND THE BUILD PROCESS



UNIT 8: PHYSICS AND THE BUILD PROCESS

- 8.A: Unit Overview
- 8.B: Instructional Resource Guide
- 8.C: Learning Activities Guide
- 8.D: Standards Alignment Guide
- 8.E: Assessment Reference Guide
- 8.F: Suggested Resources

8.A: UNIT OVERVIEW

8.A.1: UNIT DESCRIPTION



Activities in this unit of study place emphasis on managing the build process within game creation. Learners will develop skills through a project approach in a team environment as they create a simple 2D/3D game from an existing game template.

8.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Managing the Build Process
 - Asset Identification and Sources
 - Sequencing the build
- Building a Simple Game (Guided Practice)
 - Setting Up the Project
 - Backgrounds
 - Assets
 - Scripts that Enable and Disable Components
 - Scripts and Game Objects
 - Game Setup
 - Moving the Player and Cameras
 - Creating Pick-up objects
 - Collecting and Counting
 - Displaying Text
 - Publishing the Game

8.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

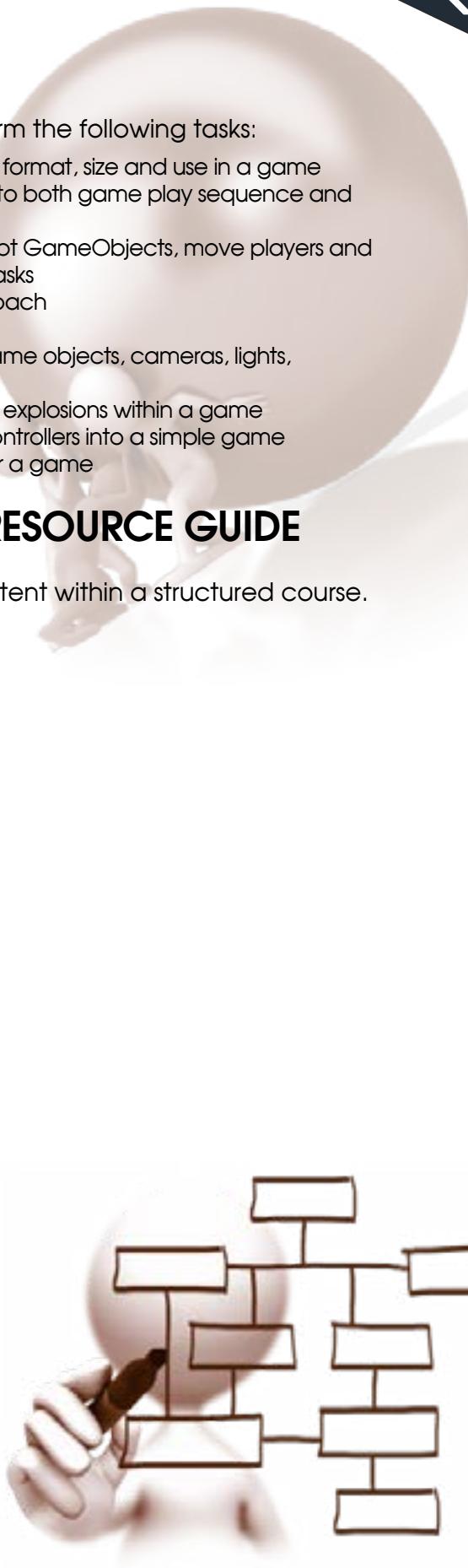
1. Select the appropriate assets for projects of adequate format, size and use in a game
2. Sequence game activities from start to finish in regard to both game play sequence and build process
3. Write scripts that enable and disable components, script GameObjects, move players and camera, pick-up objects, and perform other specific tasks
4. Create a game using a guided practice project approach
5. Setup and load a game and a development project
6. Import and manage game assets, including: player game objects, cameras, lights, and backgrounds
7. Create shots, shooting shots, boundaries, hazards ,and explosions within a game
8. Integrate audio, counting points, scores, and game controllers into a simple game
9. Project manage the build process from start to finish for a game

8.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

8.B.1: COURSE OUTLINE

1. Managing the Build Process:
 - a. WIPs (Work in Progress)
 - b. Quality Assurance
 - c. Development Milestones
2. Building a Simple Game (Guided Practice)
 - a. Setting Up a Project
 - b. Add The Player Game Object
 - c. Add Cameras and Lighting
 - d. Add a Background
 - e. Move the Player
 - f. Creating shots
 - g. Shooting Shots
 - h. Create Boundaries and Hazards
 - i. Game Controller
 - j. Spawning Waves
 - k. Audio
 - l. Counting Points and displaying Scores
 - m. Ending the Game



8.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

8.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

8.C.1.A: 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. The next set of tutorials will help learners understand the fundamentals physics tools available in the game editor. Each tutorial takes an average of five minutes to complete:

1. Colliders:
<http://unity3d.com/learn/tutorials/modules/beginner/physics/colliders>
2. Colliders as Triggers:
<http://unity3d.com/learn/tutorials/modules/beginner/physics/colliders-as-triggers>
3. Rigidbodies:
<http://unity3d.com/learn/tutorials/modules/beginner/physics/rigidbody>
4. AddForce:
<http://unity3d.com/learn/tutorials/modules/beginner/physics/addforce>
5. AddTorque:
<http://unity3d.com/learn/tutorials/modules/beginner/physics/addtorque>
6. Physics Materials:
<http://unity3d.com/learn/tutorials/modules/beginner/physics/physic-materials>

8.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

8.C.2.A: Building a Simple Game (Guided Practice)



In this activity, you will build a complete working video game, from start to finish. You will use a game project that will guide you through the entire process. Building of the game is self-paced and incremental, so follow all the steps in order. Follow the instructions provided in each tutorial and build the game using your Unity Game Engine and the assets provided. The activity is complete when you have a complete and fully working version of the game. Remember to save your work often!

The Unity Space shooter tutorial is introduced here to allow learners the ability to practice creating a game. By using an existing game project, learners will gain a clear understanding of the build process. This project will also help learners understand how physics are applied in the game environment. The project will reinforce basic skills developed in early units and will provide new skills for learners to implement in their *Capstone Project*.

Space Shooter Directions/Tutorials:

- <http://unity3d.com/learn/tutorials/projects/space-shooter/setting-up-the-project> (10 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/the-player-gameobject> (10 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/camera-and-lighting> (15 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/adding-a-background> (10 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/moving-the-player> (25 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/creating-shots> (15 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/shooting-shots> (15 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/boundary> (10 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/creating-hazards> (15 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/explosions> (5 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/game-controller> (10 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/spawning-waves> (15 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/audio> (10 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/counting-points> (20 Min)
- <http://unity3d.com/learn/tutorials/projects/space-shooter/ending-the-game> (10 Min)

8C.2.B: 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. 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.

8.C.2.C: : Project Management: Work In Progress (WIP)

There are several Project Management approaches that can be applied to the build process. One simple process is 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

game interface.



8.D: STANDARDS ALIGNMENT GUIDE

8.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 1.5.2. Use physics to create realistic motions with objects and characters..
- ⇒ 1.5.3. Explain the use of collision geometry for physics-based interactions and as programming triggers.
- ⇒ 1.5.4. Apply and manage the use of Colliders.
- ⇒ 1.5.9. Demonstrate the ability to handle object collisions and physics simulations in a realistic manner.
- ⇒ 1.6.2. Demonstrate understanding and ability to use game mechanics to improve gameplay.
- ⇒ 1.6.3. Demonstrate knowledge and understanding of balancing layouts.
- ⇒ 1.6.4. Demonstrate understanding of pathways, choke points, control points, and spawn points and other design methods for creating balance, timing, pacing and flow.
- ⇒ 1.7.15. Describe the basic logic, concepts and key structures behind computer programming languages.
- ⇒ 1.7.17. Determine appropriate programming and scripting languages to create desired game mechanics, control the environment, UI and gameplay.
- ⇒ 1.7.18. Create a hypothetical technology pipeline for an interactive application or video game project.
- ⇒ 1.8.3. Define game design documentation (GDD), its purpose & components.
- ⇒ 1.8.4. Create, iterate and maintain a full set of game design documentation.
- ⇒ 1.8.5. Prepare a plan of work based on an approved GDD including deliverables, tasks, resources, schedule, Gantt & pert charts.
- ⇒ 2.1.6. Demonstrate the use of object preferences and inspector tools.
- ⇒ 2.1.7. Accurately transform objects with respect to coordinate systems (translate, rotate and scale).
- ⇒ 2.1.8. Describe and change the active status of objects.
- ⇒ 2.1.9. Describe and change the enabled status of components.
- ⇒ 2.2.2. Understand and use hierarchical structures for organization.
- ⇒ 2.2.3. Create effective naming conventions for objects and assets.
- ⇒ 2.2.4. Apply descriptive tags, labels, and use layers for asset management.
- ⇒ 2.5.3. Demonstrate the creation, transformation, modification and use of cameras.
- ⇒ 2.6.1. Use various techniques for effectively animating objects & component properties.
- ⇒ 2.7.1. Demonstrate an understanding of mathematical concepts, logic and syntax shared by various programming languages.
- ⇒ 3.2.4. Deploy, use and demonstrate a revision control system for a new or existing project.

8.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ **CCSS.ELA-Literacy.RST.9-10.1** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- ⇒ **CCSS.ELA-Literacy.RST.9-10.3** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- ⇒ **CCSS.ELA-Literacy.RST.9-10.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
- ⇒ **CCSS.ELA-Literacy.RST.9-10.5** Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- ⇒ **CCSS.ELA-Literacy.RST.9-10.10** By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

8.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC01 ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.

8:D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Creativity and Innovation
 - Think Creatively
 - Implement Innovations
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
- ⇒ Life and Career Skills
 - Initiative and self-direction
 - Manage Goal and Time
 - Work Independently
 - Be Self-Directed Leaders

8.D.5: NEXT GENERATION SCIENCE STANDARDS (NGSS)

- ⇒ NGSS5: Using mathematics and computational thinking

8.E: ASSESSMENT REFERENCE GUIDE

8.E.1: ASSESSMENT OF LEARNING OBJECTIVES

1. The learner will create a Resource List that indicates how to acquire digital assets and all resources related to digital assets.
2. Learners will analyze a variety of game development plans before designing a plan of their own.
3. Within the assigned game project, the learner will create and write scripts that enable/disable components and manipulate and transform game assets.
4. Learners will write code that moves players in the game space and correctly applies and integrates cameras, lighting, and background into the assigned game project.
5. The learner will write and create code required to create shots and player actions into the assigned game project.
6. Learners will write and create code required to create hazards, boundaries, and explosions into the assigned game project.
7. The learner will create and manage game controllers within the assigned game project.
8. Learners will integrate audio and spawning waves into the assigned game project.
9. The learner will design and write code required to integrate counting points and score displays into the assigned game project.

8.F: SUGGESTED RESOURCES

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

1. Game options for hands-on development project:
2. Project Shooter: <http://unity3d.com/learn/tutorials/projects/space-shooter>
3. Project Roll a Ball: <http://unity3d.com/learn/tutorials/projects/roll-a-ball>
4. Game Assets: <https://www.assetstore.unity3d.com/en/>
5. Game Assets: <http://www.turbosquid.com/>
6. Audio Asset Search Resource: <https://www.makegameswith.us/gamernews/281/top-20-best-free-music-and-sound-effect-resources>
7. Search Page for Assets and Sound Resources: <http://letsmakegames.org/resources/art-assets-for-game-developers/>



UNIT 9: CONSTRUCTS OF GAME DESIGN



UNIT 9: CONSTRUCTS OF GAME DESIGN

- 9.A: Unit Overview
- 9.B: Instructional Resource Guide
- 9.C: Learning Activities Guide
- 9.D: Standards Alignment Guide
- 9.E: Assessment Reference Guide
- 9.F: Suggested Resources

9.A: UNIT OVERVIEW

9.A.1: UNIT DESCRIPTION



In this unit of study, learners will explore concepts fundamental to the ideal level design. Learners will understand the principles of navigation and the importance of a balanced layout to providing good game flow. Learners will also explore principles of functionality.

9.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Level Design
- Principles of Navigation
- Principles of Functionality
- Balancing game layout
- 2D and 3D object placement

9.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

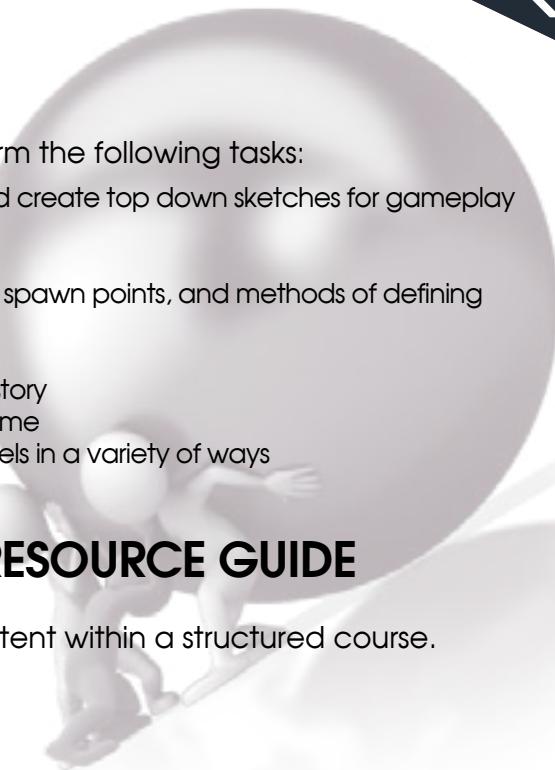
1. Plan and draw maps on paper, collect references, and create top down sketches for gameplay
2. Explain the principles of level design
3. Compare and contrast various game flows
4. Define and implement game pathways, choke points, spawn points, and methods of defining where game objects will meet at choke points
5. Explain the concept of a balanced layout
6. Describe how game levels are used to support game story
7. Create a sketch of a level layout for a hypothetical game
8. Communicate level design ideas, concepts, and models in a variety of ways
- 9.

9.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

9.B.1: COURSE OUTLINE

1. Level Design Theory
 - a. Game flow types
 - b. Creating a balanced layout
 - c. Support of the game narrative
 - d. Conveying the design
2. Level Design – soup to nuts
 - a. The big idea
 - b. From research to reference
 - c. Creating the floor plan(s)
 - d. Game Play elements
 - e. Objects
 - f. Other effects (lighting, sound, etc)
3. Understanding the flow of space:
explore how players tend to move through space in several different situations
 - a. 2D platformers
 - b. 3D first person shooters
 - c. 3D narrative spaces.
4. Level editors: Tools and tricks of the trade
 - a. Scene Editor (Unity 3D game engine)



9.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



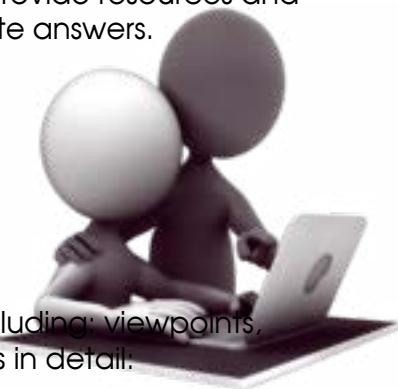
- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

9.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

9.C.1.A: Additional Unity Skill Development

In this activity, learners will experience many topics within level design, including: viewpoints, balance, and functionality. The tutorials listed below examine these topics in detail:



1. Joints:
<http://unity3d.com/learn/tutorials/modules/beginner/physics/joints0142>
2. Raycasting:
<http://unity3d.com/learn/tutorials/modules/beginner/physics/raycasting>
3. OnCollisionEnter:
<http://unity3d.com/learn/tutorials/modules/beginner/physics/on-collision-enter>

Some learners may have already included physics components in the Capstone Project at this point. As a result, some learners may desire additional time to adapt, tweak, or update previous work.

9.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

9.C.2.A: Design Document (GDD) Entry

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



9.C.2.B: 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.

9.C.2.C: 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)*.

9.C.2.D: 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!

9.C.2.E: Existing Game Assignment

1 Play the Unity game project called Stealth:

<http://unity3d.com/learn/tutorials/projects/stealth/webplayer>

2 Discuss the game flow. What are the obvious chokepoints? Explain why you believe this is or is not a balanced layout. Your task is to design a new level for this game. Sketch the layout of this new level. Identify major game pathways, choke points, and spawn points.

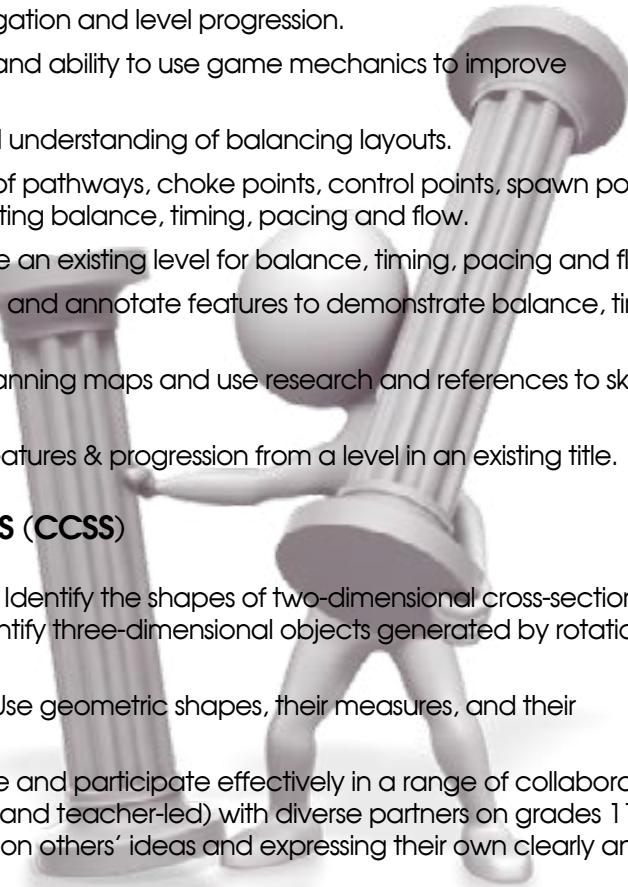
3 Write a 75-100 word description of what challenges the player will encounter in your level, what the player will have to accomplish to conquer the challenges, and what the consequences of failure are.



9.D: STANDARDS ALIGNMENT GUIDE

9.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 1.6.1. Explain principles of user navigation and level progression.
- ⇒ 1.6.2. Demonstrate understanding and ability to use game mechanics to improve gameplay.
- ⇒ 1.6.3. Demonstrate knowledge and understanding of balancing layouts.
- ⇒ 1.6.4. Demonstrate understanding of pathways, choke points, control points, spawn points and other design methods for creating balance, timing, pacing and flow.
- ⇒ 1.6.5. Sketch, analyze and annotate an existing level for balance, timing, pacing and flow.
- ⇒ 1.6.6. Block out a new, original level and annotate features to demonstrate balance, timing, pacing and flow. (APPLICATION)
- ⇒ 1.6.7. Develop level designs with planning maps and use research and references to sketch characters and environments.
- ⇒ 1.6.8. Analyze and describe level features & progression from a level in an existing title.



9.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ **CCSS.Math.Content.HSG.GMD.B.4** Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
- ⇒ **CCSS.Math.Content.HSG.MG.A.1** Use geometric shapes, their measures, and their properties to describe objects.
- ⇒ **CCSS.ELA-Literacy.SL.11-12.1** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
- ⇒ **CCSS.ELA-Literacy.SL.11-12.4** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
- ⇒ **CCSS.ELA-Literacy.SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

9.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ **SCC01 ACADEMIC FOUNDATIONS:** Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ **SCC02 COMMUNICATIONS:** Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
- ⇒ **SCC03 PROBLEM-SOLVING AND CRITICAL THINKING:** Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.
- ⇒ **SCC07 LEADERSHIP AND TEAMWORK:** Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

9:D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Creativity and Innovation
 - Think Creatively
 - Work Creatively with Others
 - Implement Innovations
 - Critical Thinking and Problem Solving:
 - Reason Effectively
 - Making Judgments and Decisions
 - Solve Problems
 - Communication and Collaboration:
 - Communicate Clearly
 - Collaborate with others
- ⇒ Life and Career Skills
 - Flexibility and Adaptability
 - Adapt to Change
 - Be Flexible
 - Initiative and self-direction
 - Manage Goals and Time
 - Work Independently
 - Be Self-Directed Learners
 - Social and Cross-Cultural Skills
 - Interact Effectively with Others
 - Work Effectively in Diverse Teams
 - Productivity and Accountability
 - Manage Projects
 - Produce Results
 - Leadership and Responsibility
 - Guide and Lead Others
 - Be Responsible to Others



9:D.5: NEXT GENERATION SCIENCE STANDARDS (NGSS)

HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

9.E: ASSESSMENT REFERENCE GUIDE

9.E.1: Level Design – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Overview	Level concept is weak; description does not respond directly to the demands of the assignment; overview needs considerable work	Level concept could use improvement; game description somewhat confusing or inconsistent; components of background story, gameplay, rules or art are lacking.	Level concept is good; gives good understanding of level; good description of background story; better-than-average description of gameplay, important rules, and art.	Level concept is original and insightful; gives an articulate and vivid understanding of level; clear description of background story; detailed description of gameplay and important rules; exceptional description of art.
Level Specifications	Significant oversight of a number of key issues: interactions, rules, mechanics, artwork, UI, levelplay, sound, characters, levels, scripts.	Only partially develops the “rule book”; some components need work: interactions, rules, mechanics, artwork, UI, levelplay, sound, characters, levels, scripts.	A good “rule book” for the level; describes the types of interactions the player can have; would be fairly easy to turn into a manual; good use of screenshots / artwork.	Exceptional “rule book” for level; clear description of interactions, rules, mechanics, artwork, UI, levelplay, sound, characters, scripts; excellent use of sketches/ artwork.
Technical Specifications	Written in a format that is difficult to implement; unclear; no significant consideration of implications, exceptions, and exact limits.	Level specs for the most part are translated into tech specs in an unclear, unspecific, or non-implementable manner; moderate consideration of implications, exceptions, and exact limits.	Most rules from level specs translated into a specific, unambiguous, and implementable format; good use of screenshots/artwork	All rules from level specs translated into an exceptionally clear, specific, unambiguous, and implementable format; superb consideration of implications, exceptions, and exact limits; excellent use of sketches / artwork.
Language and structure	Some major grammatical or proofreading errors; misspelled words, awkward grammar, needless repetitions, unstated assumptions, vague assertions and omissions of important features; poor format.	Several unclear or awkward sections; includes a number of misspelled words, awkward grammar repetitions, unstated assumptions or vague assertions; document structure lacking; problems.	Some mechanical difficulties or stylistic problems; may make occasional problematic word choices or awkward syntax errors; good document structure; minor problems.	Uses sophisticated sentences effectively; chooses words aptly; observes conventions of written English and manuscript format; excellent document structure.

9.E.2: ASSESSMENT OF LEARNING OBJECTIVES

1. Using a pencil and paper, the learner will be able to design a complete level map.
2. Learners will be able to create a thorough and detailed written level walkthrough, including map sketches, for at least two levels of their *Capstone Project*.
3. Within a live, small group environment, the learner will be able explain the purpose of chokepoints and discuss the six principles of flow point design.
4. Learners will be able to design a game level incorporating (at least 6 of the 8 dimensions of) flow and indicate how the layout and challenges of the level achieve each element.

9.F: SUGGESTED RESOURCES

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

1. 6 Principles of Choke Point Level Design https://www.youtube.com/watch?feature=player_embedded&v=RO9ftM_VYs & <http://worldofleveldesign.com/categories/csgo-tutorials/csgo-principles-choke-point-level-design.php>
2. How to Design Gameplay Map Layouts (Complete In-Depth Guide) https://www.youtube.com/watch?feature=player_embedded&v=YBTWe2xUcAM & <http://worldofleveldesign.com/categories/csgo-tutorials/csgo-how-to-design-gameplay-map-layouts.php>
3. Flow theory <http://www.gamehead.com/article/1510/flow-theory-what-makes-good-game>
4. Level Design Concepts <http://www.hobbygamedev.com/articles/vol5/level-design-concepts/>
5. Good level design reference database <http://level-design.org/referencedb/index.php?/category/44>
6. Bio of a level designer <http://www.2d-chris.com/about/>
7. Good overview of level design <http://www.gdcvault.com/play/1020172/Level-Design-in-a-Day> (start with slide 25)



UNIT 10: PRINCIPLES OF CAMERAS AND LIGHTING IN GAME ENVIRONMENTS



UNIT 10: PRINCIPLES OF CAMERAS AND LIGHTING IN GAME ENVIRONMENTS

- [10.A: Unit Overview](#)
- [10.B: Instructional Resource Guide](#)
- [10.C: Learning Activities Guide](#)
- [10.D: Standards Alignment Guide](#)
- [10.E: Assessment Reference Guide](#)
- [10.F: Suggested Resources](#)

10.A: UNIT OVERVIEW

10.A.1: UNIT DESCRIPTION



Activities in this unit of study are designed to introduce effective use of cameras and lighting within game design. The focus will be on effective placement of lights and cameras to engage the learner in the game environment and create the atmosphere for the overall game experience.

10.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Cameras and Lights for Mood and Direction
- Light Types (e.g. Spot, Directional, Point, Area)
- Lighting Direction, Intensity, and Color
- Viewpoint and Perspective (e.g. distance rendering , first person, third person, orthographic, perspective, oblique projection)
- Camera angles and Positioning (e.g. composition, environment creation, usability, immersion)

10.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

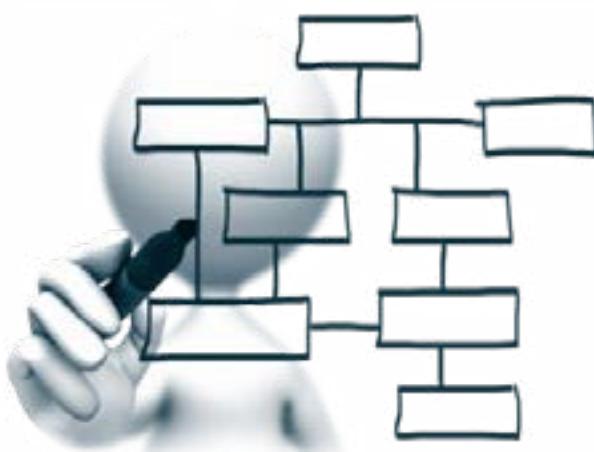
1. Apply the Rule of Thirds
2. Demonstrate the importance of scene balancing
3. Explain how viewpoint impacts gameplay
4. Create atmosphere and enhance emotion through the principles of lighting
5. Position lighting and cameras in order to focus attention within a game
6. Create and place cameras within 2D and 3D game environments

10.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

10.B.1: COURSE OUTLINE

1. Fundamentals of Lighting
 - a. Understand how real world, practical lighting works
 - b. Basic color theory
 - c. Types: Point, Area, Directional, Ambient, Spot
 - d. Lighting models: ambient, diffuse, emissive, and specular
 - e. Properties: color, shape/size, direction, intensity
 - f. Three-point lighting: Key light (or Main), Fill light, and Rim light (or Backlight)
2. Fundamentals of Camera use in video game design
 - a. Essentials of scene composition and the Rule of Thirds
 - b. Types: fixed camera systems, tracking cameras, interactive camera systems
 - c. Understanding the 3D camera view:
position, aim direction, field of view
 - d. Introduction to projection types:
perspective, orthographic, and oblique
3. Viewpoint and perspective
 - a. 2D - Top-down and side-scroller
 - b. 3D – Fixed 3D, first person, and third person
 - c. 2.5D, 3/4 perspective, and pseudo-3D
 - d. Projection types
4. Bringing it all together: how cameras and lighting are used to engage and immerse the gamer.
 - a. Mood Boards



10.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

10.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

10.C.1.A: Unity Camera Skill Development

This tutorial provides a brief overview on the camera features in Unity and is used to supplement live instruction. Instructors are encouraged to supplement this tutorial with live instruction on the use of camera techniques for creating engaging game environments and immersive player experience.

<http://unity3d.com/learn/tutorials/modules/beginner/live-training-archive/cameras>

10.C.1.B: Unity Lighting Skill Development

This tutorial provides a brief overview on the lighting features in Unity and is used to supplement live instruction. Instructors are encouraged to supplement this tutorial with live instruction on the use of lighting techniques for creating engaging game environments and immersive player experience

<http://unity3d.com/learn/tutorials/modules/beginner/live-training-archive/lights>

Some learners may have already included cameras and lighting in their *Capstone Project*. If so, they may desire additional time to return to their project and adapt, tweak, or update previous work.

10.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES



10.C.2.A: 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.

10.C.2.B: 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.

10.C.2.C: 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)*.

10.C.2.D: 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 <https://www.youtube.com/watch?v=M627-obxNzg>
- Spiderman: The Game <https://www.youtube.com/watch?v=KLuBxePSNOU>
- Final Fantasy IV <https://www.youtube.com/watch?v=lT12DW2Fm9M>
- Myst III <https://www.youtube.com/watch?v=XyQxuk5Jkqc>
- Mirror's Edge <https://www.youtube.com/watch?v=2N1TJP1cxmo>

10.C.2.E: 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.

10.C.2.F: Three-Point Lighting Tutorial

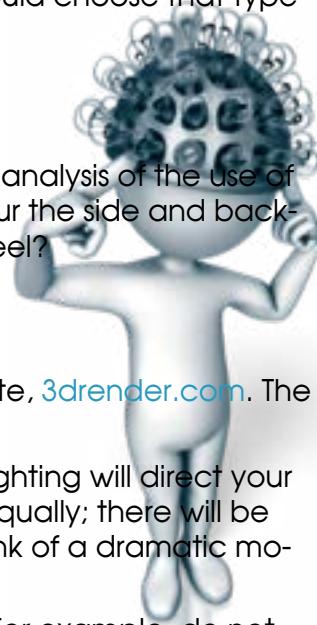
Complete the Three-point lighting tutorial found at <http://www.3drender.com/light/3point.html>- following tutorial

10.C.2.G: Existing Game Assignment

Download and play the Mothhead game at: <http://unity3d.com/pages/mothhead>. 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?

10.C.2.H: Camera Use Tutorial

View the Unity tutorial on camera use at <http://unity3d.com/learn/tutorials/modules/beginner/live-training-archive/cameras>. Discuss the use of orthographic versus perspective cameras. Provide examples of how you would use each type and explain why you would choose that type to achieve your purpose.



10.C.2.I: Butterfly Effect Activity

Look at this scene from the short film “The Butterfly Effect.” Write a critical analysis of the use of light, color, and clarity. Discuss why the creators might have chosen to blur the side and background features of this scene. What emotion does this scene make you feel?

10.C.2.J: Room lighting assignment

Light Jeremy Birn’s kitchen scene from Lighting Challenge #2 on his website, 3drender.com. The scene is available at: <http://www.3drender.com/challenges/>

Your lighting will create a focal point in the kitchen. This means that the lighting will direct your audience to what is important for them to see. Not everything will be lit equally; there will be some areas that are brighter and some that are darker. It can help to think of a dramatic moment that has or is about to occur.

The view of the kitchen you choose should be more than a small still life. For example, do not just light the fruit on the counter; you will need more than 3-point lighting of a few objects. You do not have to use the entire room. Take into consideration practical light sources even if they are not in your view. The kitchen model does not include geometry for light fixtures, but you can imagine that there might be recessed ceiling lights or a light as part of the fan. You do not need to make geometry for these as they are hidden or offscreen. In addition to practical light sources, remember that most surfaces reflect at least some light onto other objects. Unless you use global illumination, this has to be faked by putting in extra “bounce” lights. There are times you can use area lights for this, but it is too expensive (take too long to calculate) to use an area light that is the size of every wall. If you show the window, you will probably want to put a polygon behind the window and texture map an image to it to show what is outside. Take special care that your image makes sense with regard to view angle, perspective, and depth. Errors in matching the image to the scene are very common in this assignment and ruin the illusion you are trying to create.

None of the objects in the scene have shaders or UV maps. You do not have to add shaders to the model, but if you do, spend only minimal time setting up a few fairly generic shaders. This assignment is primarily concerned about lighting techniques and that is what you will be evaluated on.

You must have these elements:

- Camera View, showing that this room is a kitchen and/or dining area.
- Lighting, that creates a focus for the image.
- Shadows, including contact shadows or ambient occlusion.
- If you use GI, you must also include direct lighting.
- If you do not use GI, you must include some source of “bounced” lighting.

Additional design goals:

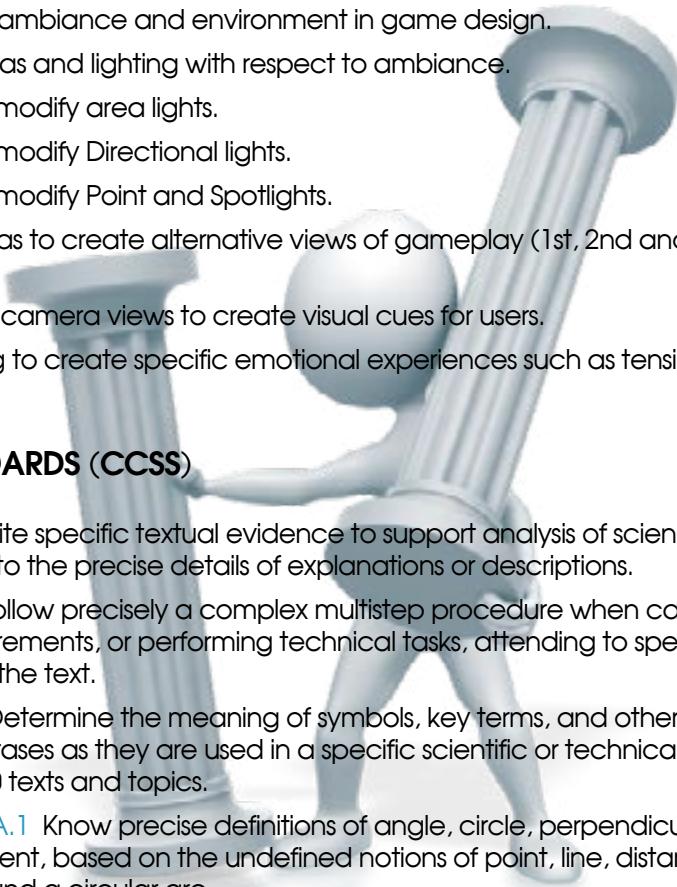


- A well balanced composition
- Lighting and shadows should help break up 3d space to help define what is close and what is far.
- Lighting should define forms and separate them from their backgrounds, if appropriate.

10.D: STANDARDS ALIGNMENT GUIDE

10.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 1.1.9 Explain the relevance of ambiance and environment in game design.
- ⇒ 2.5.1 Explain the role of cameras and lighting with respect to ambiance.
- ⇒ 2.5.2.1 Create, transform and modify area lights.
- ⇒ 2.5.2.3 Create, transform and modify Directional lights.
- ⇒ 2.5.2.4 Create, transform and modify Point and Spotlights.
- ⇒ 2.5.4 Explain the use of cameras to create alternative views of gameplay (1st, 2nd and 3rd person perspectives).
- ⇒ 2.5.5 Effectively use framing & camera views to create visual cues for users.
- ⇒ 2.5.6 Use cameras and lighting to create specific emotional experiences such as tension, fear, excitement.



10.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.RST.9-10.1](#) Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- ⇒ [CCSS.ELA-Literacy.RST.9-10.3](#) Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- ⇒ [CCSS.ELA-Literacy.RST.9-10.4](#) Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
- ⇒ [CCSS.Math.Content.HSG.CO.A.1](#) Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
- ⇒ [CCSS.Math.Content.HSG.CO.A.2](#) Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

10.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC01 ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
- ⇒ SCC03 PROBLEM-SOLVING AND CRITICAL THINKING: Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.
- ⇒ SCC07 LEADERSHIP AND TEAMWORK: Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives..

10:D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Creativity and Innovation
 - Think Creatively
 - Implement Innovations
 - Critical Thinking and Problem Solving:
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
- ⇒ Life and Career Skills
 - Initiative and self-direction
 - Manage Goals and Time
 - Work Independently
 - Be Self-Directed Learners



10.E: ASSESSMENT REFERENCE GUIDE

10.E.1: Mood Board – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Creativity	Method was thoughtless and off task.	Little thought into the placement of pictures. Minimal thought went into the style of writing used in the labeling of pictures.	Shows some creative arrangement of pictures, but could be improved. Labeling is somewhat creative, but could be improved.	Pictures/items arranged in a creative way. Labeling of pictures is in a stylized handwriting that complements the overall look of the board. Incorporates materials other than magazine clippings.
Neatness	Pictures are very roughly cut. Gluing is very messy. Labeling is messy, difficult to read or missing entirely.	Pictures are roughly cut. Gluing is messy. Corners are sticking up and some are coming off. Labeling is messy.	Pictures are somewhat neatly cut. Gluing is mostly neat and corners are mostly secure. Labeling is mostly neat.	Pictures are neatly cut. Gluing is neat and corners of pictures are secure. Labeling is neat. Professional appearance.

10.E.4: Sample Room Lighting – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Believability	Lighting breaks laws of physics and/or looks fake.	Several areas where lighting does not look real.	Lighting is mostly believable, with small areas where it doesn't look quite real.	Lighting obeys real world physics and looks like it could exist in real life.
Lighting techniques: focus and direct light	Little thought put into lighting setup. Main subject may not be clear. Other surfaces may be lit poorly.	Lighting setup is basic but solid. Focus may not be entirely clear. Lighting of other surfaces may work for some objects and not others. Image may have areas of excessive brightness or dimness. Some poor color or light intensity choices.	Lighting has clear focus and goes beyond basic 3-light setup to show nuances in form and surfaces. Most surfaces are neither too bright nor too dim. Light color, intensity, and fall off work with scene.	Lighting has clear focus. Lighting goes beyond basic 3-light setup to show exceptional nuances in form and surfaces. Lighting is neither too bright nor too dim in any part of the frame. Light color, intensity, and fall off enhance scene.
Lighting techniques: GI or indirect lighting	GI or bounce lighting is missing or minimal	GI or bounce lighting may not be working on all areas.	GI or bounce lighting is balanced with direct/key lighting and adds realism to some areas of the scene.	GI or bounce lighting is balanced with direct/key lighting and adds realism throughout the scene.
Shadows	Several shadows are missing and/or basic properties of shadows not working.	Some objects are missing contact shadows or contact shadows are not convincing. Cast shadows may have errors in color or softness.	All objects have appropriate and believable contact shadows or ambient occlusion. Primary lights cast shadows with appropriate color and softness.	Objects have appropriate and believable contact shadows or ambient occlusion. Primary lights cast shadows with appropriate color and softness.
Aesthetic/design principles: color, composition	Little attention to aesthetic principles; elements work against content	Some aesthetic choices work, but some do not support the content. Some lighting may not work with composition or scene design.	Good use of aesthetic principles in scene design and composition of frame; elements reinforce the content.	Exceptional attention to aesthetic principles in scene design and composition of frame; lighting used as compositional element that enriches the content.

10.E.5: ASSESSMENT OF LEARNING OBJECTIVES

1. The learner will be able to compare and contrast various ways to simulate light in a computer graphics environment. This includes: light mapping to light placement, explaining the advantages and disadvantages of each method, and hypothesizing on when each type of light is best employed.
2. Learners will create a focal point lighting scheme, focusing the viewer's attention to a specific element of an image.
3. The learner will be able to light a basic room, evoking three different emotions (i.e., sadness, fear, and comfort).

10.F: SUGGESTED RESOURCES

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

1. A Layman's Guide to Projection in Video Games <http://www.significant-bits.com/a-laymans-guide-to-projection-in-videogames>
2. Light up your world: How Lighting Makes All the Difference for Games <http://blog.digitaltutors.com/understanding-the-importance-of-lighting-for-games/>
3. Lighting tutorial on properties of light and its impact on perception <http://www.amaanakram.com/lightingT/part1.htm>
4. Scenes and models available for classroom projects <http://www.3drender.com/index.html>



UNIT 11: PRINCIPLES OF SOUND AND AUDIO FOR GAMERS



UNIT 11: PRINCIPLES OF SOUND AND AUDIO FOR GAMERS

- 11.A: Unit Overview
- 11.B: Instructional Resource Guide
- 11.C: Learning Activities Guide
- 11.D: Standards Alignment Guide
- 11.E: Assessment Reference Guide
- 11.F: Suggested Resources

11.A: UNIT OVERVIEW

11.A.1: UNIT DESCRIPTION



Activities in this unit of study are designed to explore the various applications of sound and music, including the selection of appropriate choices, and the optimization of asset formats.

11.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Enhancing Game Experience with Sound and Audio
- Audio sources (e.g. formats, priority settings)
- 2D and 3D Sound
- Sound FX (e.g. foley, ambient sounds, player functional sounds, compression, doppler)
- Sound Tracks (e.g. original score, franchise score)
- Dialogue (e.g. game, character, player)
- Menu sound (e.g. ambient sound, button sounds)
- Audio Scripting
- Intellectual Property

11.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

1. List the different types of audio files used in most game engines
2. Describe how sound files and music are used to enhance game experience and provide realism
3. Apply audio and audio effects to create realistic game environments
4. Manage priority settings of multiple sound sources
5. Explain the Doppler Effect and describe how to apply it within the game environment
6. Create scripts to manage audio files within the game environment
7. Apply 2D and 3D sounds appropriately within the game environment
8. Position sounds within the game environment to improve gameplay
9. Manipulate sound to create realistic effects like “roll-off” in a game
10. Implement basic sound compression techniques in a game
11. Manage external sound and music assets that contain intellectual property protection agreements

11.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

11.B.1: COURSE OUTLINE

1. Enhancing Game Experience with Sound and Audio
 - a. Sounds for game realism
 - i. Motors, Lasers, Other sound
 - b. Adding dialogue to the game
 - i. Game
 - ii. Character
 - iii. Player
 - c. Selecting appropriate music for game experience
 - d. Finding Sound and Music Sources
 - e. Proper use of copyrighted music and sound files
2. Audio sources
 - a. Choosing correct sound file types
 - i. Wav files
 - ii. MP3 files
 - iii. MIDI Files
 - iv. API Sources: OGG Vorbis, FMOD, SDL

3. 2D and 3D Sound
 - a. Overview of Mono and Stereo format and 2D/3D Sound
 - b. 3D Sound Settings and Applications
 - c. 2D Sound Settings and Applications
4. Sound FX: Compression, Doppler, priority settings, playback
 - a. What is Audio Compression and When to Use it
 - b. Introduction to the Doppler Effect
 - c. Applying the Doppler Effect to Game Assets
 - d. Setting Sound Priorities
 - e. Volume Rolloff and Rolloff Settings
5. Audio Scripting
6. Using scripts to sequence audio events



11.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

11.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

11.C.1.A: 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 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

11.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

11.C.2.A: Game Design Document (GDD) Entry

1

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.



11.C.2.B: Game Design Document (GDD)

2

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

11.C.2.C: Project Management

3

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)*.

11.C.2.D: Capstone Project Activities

First, analyze your game, placing a special focus on audio for player engagement. 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 that game 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: <http://unity3d.com/pages/the-chase>
- Among the Sleep: <http://unity3d.com/showcase/case-stories/among-the-sleep>
- Bowling: <http://www.games.jocuri-unity3d.com/bowling-3d.html>

11.C.2.E: Additional Skill Development

The tutorial in this unit is intended to help learners fully understand how music and sound effects add to engagement and excitement in the game:

Audio Listeners & Sources: <http://unity3d.com/learn/tutorials/modules/beginner/audio/lessons/audio-sources-and-listeners>

11.C.2.F: 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, [http://unity3d.com/learn/tutorials/projects/roll-a-ball-in-Unity](http://unity3d.com/learn/tutorials/projects/roll-a-ball-in-unity). Add sounds to objects in the game that evoke specific moods, actions, or that increase the level of excitement. Integrate 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: Read the audio section in the Unity Manual (<http://docs.unity3d.com/Manual/Audio.html>) and develop a brief comparison and contrast paper identifying the predominant music and sound file formats.
 - a. Identify the most common files used in audio video game development and describe their primary attributes and capabilities.
 - b. List advantage and disadvantages of each file format for game development.
3. Audio Components Activity: View this tutorial (<http://docs.unity3d.com/Manual/comp-AudioGroup.html>) 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 Sound
 - 3D Sound
 - Doppler Effect
 - Sound Rolloff
 - Monophonic Sound
 - Stereophonic Sound
 - Compression
 - Reverb
 - Loop
 - Effects
 - Audio Clip
 - Pitch



11.D: STANDARDS ALIGNMENT GUIDE

11.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 1.7.1. Assess and employ various technology and processes for producing deliverables that meet requirements and quality standards.
- ⇒ 1.7.14. Explain the usage of audio file formats and file interoperability.
- ⇒ 1.7.10.2. Define “Codec” and describe their use.
- ⇒ 1.7.6. Demonstrate a working knowledge of audio capture & editing tools.
- ⇒ 2.4.1. Implement environmental designs into 2D & 3D levels.
- ⇒ 2.4.4. Create, edit and enhance environments to optimize quality.

11.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.RST.9-10.1](#) Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- ⇒ [CCSS.ELA-Literacy.RST.9-10.9](#) Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- ⇒ [CCSS.ELA-Literacy.RST.9-10.5](#) Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g. force, friction, reaction force, energy).

11.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC01 ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
- ⇒ SCC04 INFORMATION TECHNOLOGY APPLICATIONS: Use information technology tools specific to the career cluster to access, manage, integrate, and create information.

11:D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
 - ICT (Information, Communications and Technology) LITERACY
 - Apply Technology Effectively
- ⇒ Life and Career Skills
 - Flexibility and Adaptability
 - Be Flexible



11.E: ASSESSMENT REFERENCE GUIDE

11.E.1: Capstone Audio Assignment – Assessment Rubric

	Unacceptable	Basic	Proficient	Distinguished
Use of Audio Effects	No effects used or do not match the game.	A few audio effects are used and do not always match the game.	Some effects are used appropriately and match the game most of the time.	Audio effects are consistently used appropriately and match and enhance the game.
Audio Sources	Improper use of sound and audio files (IP) and genre not right for game.	Sound and audio files work for the genre of the game, but lacks realism and effect. Legal use of files is evident.	Good sound and music selection for genre of game.	Exceptional use of sound and audio files in terms of genre, game requirements, and engagement.
Technical Production	Volume changes, highly distracting.	Volume is occasionally inconsistent.	Volume is acceptable.	Volume of music and effects enhance the presentation.
Fade Placement and Gain	No use of fade or level adjustment.	Smooth fade in and out of some sections. Sections placed inappropriately and poor levels.	Smooth fade in and fade out of each section, sections placed appropriately, but with poor levels.	Smooth fade in and fade out of each section, sections placed appropriately with good levels.

11.E.2: ASSESSMENT OF LEARNING OBJECTIVES

1. The learner will compare and contrast: common audio and sound file formats, their applications in the game, and the methods for acquiring the assets.
2. Learners will summarize the science of how each sound effect works and can recommend use case scenarios for common sound effects within the game environment.
3. Through the creation of a game snippet, the learner will integrate the Doppler Effect in the game environment.
4. The learner will write scripts to position sounds within the game environment.
5. Through individual research activities, learners will identify genres of music and will record judgments as to which genre is most appropriate for a given type of video game.
6. Within a written document, the learner will summarize and paraphrase the various rules and laws pertaining to the proper utilization of external intellectual property within a game.

11.F: SUGGESTED RESOURCES

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

1. Audio (Unity Manual) <http://docs.unity3d.com/Manual/Audio.html>
2. Sound Formats and Their Uses in Games: http://www.gamedev.net/page/resources/_/technical/game-programming/sound-formats-and-their-uses-in-games-r1902
3. Audio Listeners & Sources: <http://unity3d.com/learn/tutorials/modules/beginner/audio/lessons/audio-sources-and-listeners>
4. Unity Game Development in 24 Hours <http://www.amazon.com/Unity-Development-Hours-Teach-Yourself/dp/0672336960>
5. Integrating Audio in your Game: The Wise Approach <http://wwwaudiokinetic.com/download/documents/TheWwiseApproach.pdf>
6. Game Development Essentials: Game Audio Development <http://wwwamazon.com/Game-Development-Essentials-Audio/dp/1428318062>
7. Adaptive Audio: A Beginner's Guide to Making Sounds for Video Games http://wwwgamecareerguide.com/features/696/adaptive_audio_a_beginners_guide_.php
8. Hey, That's MY Game! Intellectual Property Protection for Video Games http://wwwgamasutra.com/view/feature/131951/hey_thats_my_game_intellectual_.php?print=1



UNIT 12: STRATEGIC GAME DEVELOPMENT TECHNIQUES AND CONCEPTS



UNIT 12: STRATEGIC GAME DEVELOPMENT TECHNIQUES AND CONCEPTS

- 12.A: Unit Overview
- 12.B: Instructional Resource Guide
- 12.C: Learning Activities Guide
- 12.D: Standards Alignment Guide
- 12.E: Assessment Reference Guide
- 12.F: Suggested Resources

12.A: UNIT OVERVIEW

12.A.1: UNIT DESCRIPTION



Activities in this unit of study are designed to focus on the creation of advanced animations and graphical user interfaces (GUI's) that are adaptable to a variety of platforms and play levels.

12.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Advanced User Interfaces for Multi-Devices and Platforms (e.g. custom GUI styles, skins)
- Advanced Animation Techniques (e.g. humanoid avatars)
- Blend Trees

12.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

1. Design engaging and efficient user interfaces for a variety of devices and platforms
2. Create unique interface skins that are applicable to multiple devices
3. Create, manipulate, and transform animation controllers
4. Create animator components
5. Create animations that utilize blend trees
6. Assemble animator assets that are part of a project
7. Manage animators with scripts
8. Manipulate humanoid avatars and animation properties

12.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

12.B.1: COURSE OUTLINE

1. Creating Intermediate Level Game Interfaces
 - a. Using Externally Created Skins in Unity
 - b. Custom GUI Styles in Unity
2. Creating Intermediate Level Animations in Unity
 - a. Intermediate Animations
 - b. Preparing Models for Animation
 - c. Humanoid Avatars
 - d. States and Blend Trees
 - e. Avatars
3. Project Creation
 - a. Project build



12.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

12.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

12.C.1.A: Creating Advanced User Interfaces in Unity

The tutorials listed below introduce 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.

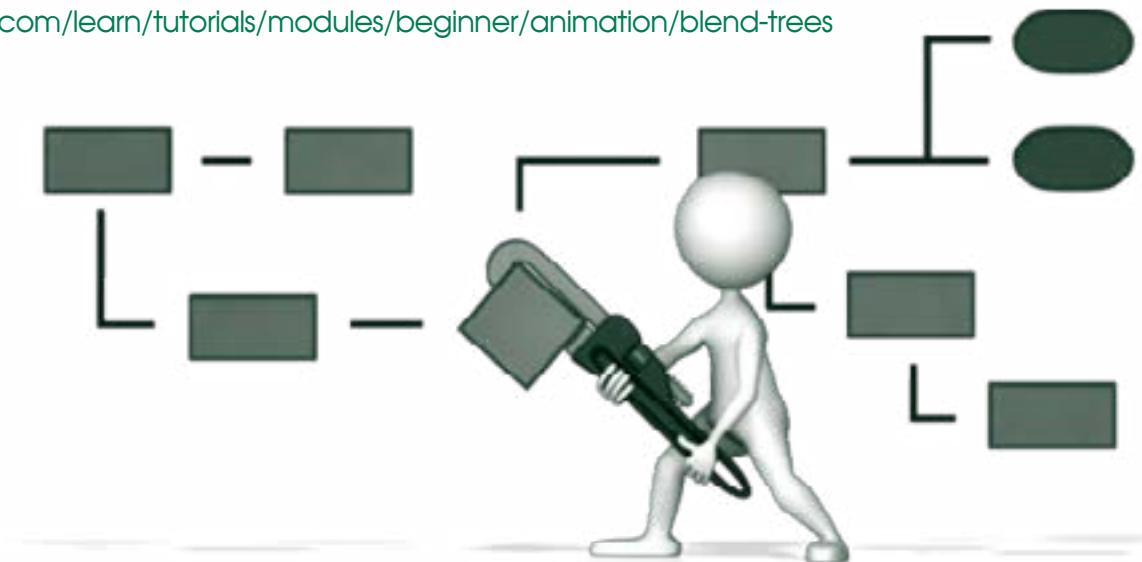
1. Unity GUI Tutorial – Scale UI to the Right Size for Every Resolution
<http://www.youtube.com/watch?v=hzvQnYkS9O4>
2. Creating a GUI in Photoshop and Unity 3d Part 1
<http://www.youtube.com/watch?v=H4Tpq6D5cl>
3. 3d Modeling Architecture Part 1: Planning your textures
<http://www.youtube.com/watch?v=EwZyGoxqh2Y&list=PL3bRqax9US6LhaAPLagGp7j5RtuvEUB0H>
4. Unity Game Design: Part 22-Gui Skin
<http://www.youtube.com/watch?v=CfqM55K0rfU>



12.C.1.B: Additional Skill Development in Unity

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:

1. Animation Advanced
<http://unity3d.com/learn/tutorials/modules/beginner/animation/Animator-component>
2. Humanoid Avatars
<http://unity3d.com/learn/tutorials/modules/beginner/animation/avatars>
3. Blend Trees
<http://unity3d.com/learn/tutorials/modules/beginner/animation/blend-trees>



12.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES



12.C.2.A: 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?

12.C.2.B: 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.

12.C.2.C: Project Management

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)*.



12.D: STANDARDS ALIGNMENT GUIDE

12.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 1.5.2. Use physics to create realistic motions with objects and characters.
- ⇒ 1.5.3. Explain the use of collision geometry for physics-based interactions and as programming triggers.
- ⇒ 1.5.4. Apply and manage the use of Colliders.
- ⇒ 1.5.9. Demonstrate the ability to handle object collisions and physics simulations in a realistic manner.
- ⇒ 1.6.2. Demonstrate understanding and ability to use game mechanics to improve gameplay.
- ⇒ 1.6.3. Demonstrate knowledge and understanding of balanced layouts.
- ⇒ 1.6.4. Demonstrate an understanding of pathways, choke points, control points, spawn points and other design methods for creating balance, timing, pacing and flow.
- ⇒ 1.7.15. Describe the basic logic, concepts and key structures behind computer programming languages.
- ⇒ 1.7.17. Determine appropriate programming and scripting languages to create desired game mechanics, control the environment, UI and gameplay.
- ⇒ 2.1.6. Demonstrate the use of object preferences and inspector tools.
- ⇒ 2.1.7. To reposition objects using the transform (translate, rotate, scale) tools, with respect to World and Local coordinate systems.
- ⇒ 2.1.8. Describe and change the active status of objects.
- ⇒ 2.1.9. Describe and change the enabled status of components.
- ⇒ 2.2.2. Assess and employ strategies for hierarchical structures, used for organization.
- ⇒ 2.2.3. Create an effective naming conventions for objects and assets.
- ⇒ 2.2.4. Apply descriptive tags, labels, and use layers for asset management.
- ⇒ 2.5.3. Demonstrate the creation, transformation, modification and use of cameras.
- ⇒ 2.6.1. Use various techniques for effectively animating objects & component properties
- ⇒ 2.7.1. Demonstrate an understanding of mathematical concepts, logic and syntax shared by various programming languages.
- ⇒ 3.2.4. Assess and execute strategies for a revision control system within a new or existing project.
- ⇒ 3.3.7. Demonstrate the use of a debugger to inspect code at runtime.

12.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.RST.9-10.1](#) Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
- ⇒ [CCSS.ELA-Literacy.RST.9-10.3](#) Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- ⇒ [CCSS.ELA-Literacy.RST.9-10.4](#) Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

12.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC01 ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within a career cluster.
- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.

12.D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Creativity and Innovation
 - Think Creatively
 - Implement Innovations
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Communication and Collaboration:
 - Communicate Clearly
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
- ⇒ Life and Career Skills
 - Initiative and Self-Direction
 - Manage Goals and Time
 - Work Independently
 - Be Self-Directed Learners

12.D.5: NEXT GENERATION SCIENCE STANDARDS (NGSS)

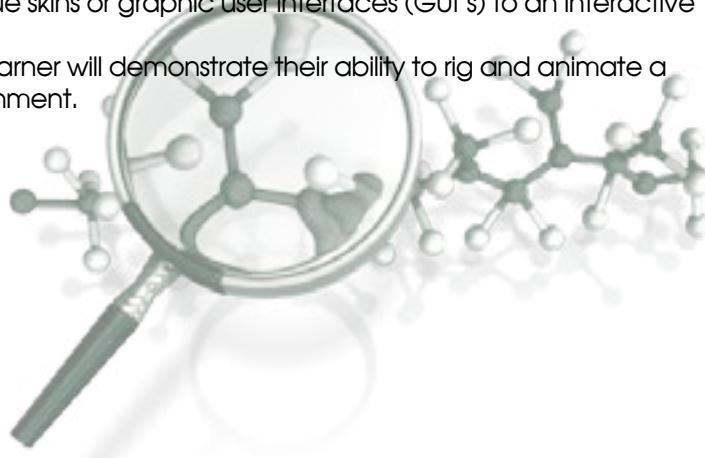
- ⇒ NGSS5: Using mathematics and computational thinking



12.E: ASSESSMENT REFERENCE GUIDE

12.E.1: ASSESSMENT OF LEARNING OBJECTIVES

1. The learner will be able to create and manage Blend Trees and states of animated models.
2. Learners will be able to create unique skins or graphic user interfaces (GUI's) to an interactive application or video game.
3. Within their *Capstone Project*, the learner will demonstrate their ability to rig and animate a humanoid avatar in a game environment.



12.F: SUGGESTED RESOURCES

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

1. Unity Tutorials and Resources: <http://unity3d.com/learn/tutorials/modules>
2. Great Resource for Animation and GUI Development: Unity Game Development in 24 Hours, Sams Teach Yourself: <http://www.amazon.com/Unity-Development-Hours-Teach-Yourself/dp/0672336960>



UNIT 13: PRINCIPLES OF QUALITY AND FUNCTIONALITY ASSURANCE IN GAME DEVELOPMENT



UNIT 13: PRINCIPLES OF QUALITY AND FUNCTIONALITY ASSURANCE IN GAME DEVELOPMENT

- 13.A: Unit Overview
- 13.B: Instructional Resource Guide
- 13.C: Learning Activities Guide
- 13.D: Standards Alignment Guide
- 13.E: Assessment Reference Guide
- 13.F: Suggested Resources

13.A: UNIT OVERVIEW

13.A.1: UNIT DESCRIPTION



Activities in this unit of study are designed to introduce learners to quality and functionality assurance. This unit will focus specifically on the testing, troubleshooting, and debugging of an interactive application or video game.

13.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Test teams (e.g. internal, external)
- Testing focus (e.g. usability, functionality, performance, load, build verification, game balance)
- Product testing procedures (e.g. alpha, beta)
- Defect tracking databases

13.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

1. Explain the importance of QA and testing
2. Explain the importance of documentation during testing stages
3. Explain the necessity of a defect tracking database
4. Describe basic troubleshooting strategies
5. Perform successful debugging and troubleshooting activities within a game environment
6. Locate bugs within a game environment using debugging software tools

13.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

13.B.1: COURSE OUTLINE

1. Overview of testing
 - a. Purpose of testing
 - b. Who does the testing
 - c. When testing should be done
2. Verification versus validation
3. Relationship between testing, quality assurance, and quality control
4. Levels of software testing
 - a. Functional
 - i. Acceptance testing: alpha, beta
5. Non-functional
 - a. Performance: load and stress testing
 - b. Usability
 - c. Security
 - d. Portability
6. Testing Documentation: test plan, test cases/scenarios
7. Defect Tracking
 - a. Parameters
 - b. Defect life cycle



13.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

13.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

13.C.1.A: 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>

1

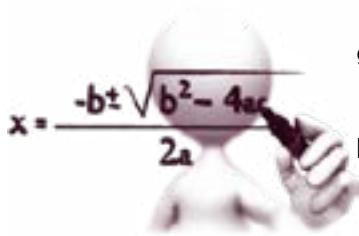
The learner's task is to utilize the buggy code, taking note of any error messages that appear. Note that not all of the errors will be indicated at the beginning. This is because some of the bugs may prevent entire functions from executing. Only when the general structure of the function is fixed will 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:

- a. 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.
- b. 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.
- c. Adopt proper formatting techniques by spacing out your code and indenting it properly. This will make it easier to read and isolate errors.
- d. 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.

2

Finding common errors:



- e. 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.
- f. 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.
- g. 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?
- h. 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.

13.C.2: SELF-PACE LEARNING (SPL) ACTIVITIES

13.C.2.A: Game Design Document (GDD) Entry

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

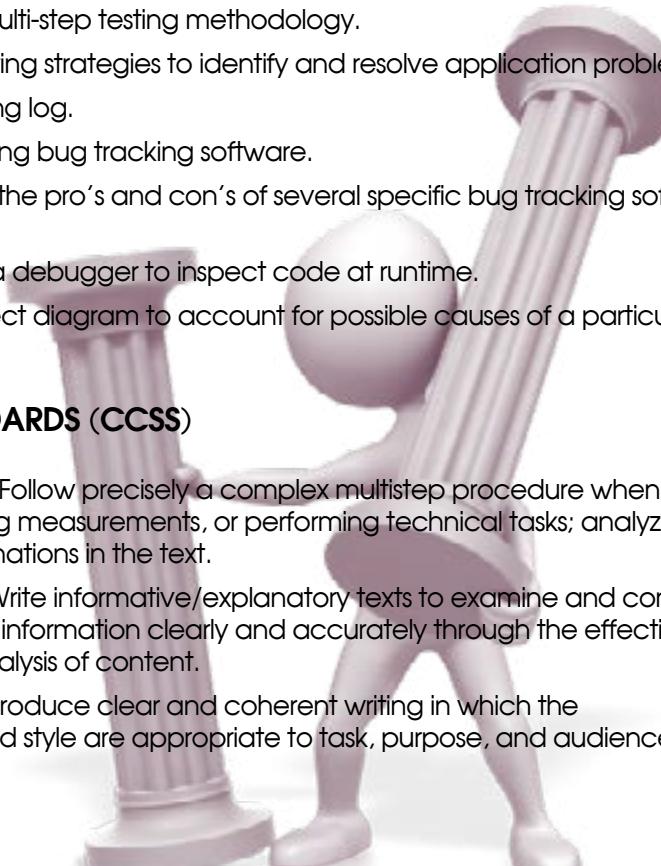
13.C.2.B: Capstone Project

Debug your Capstone Project game

13.D: STANDARDS ALIGNMENT GUIDE

13.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 3.3.1. Graphically describe a multi-step testing methodology.
- ⇒ 3.3.2. Use general troubleshooting strategies to identify and resolve application problems.
- ⇒ 3.3.4. Develop a troubleshooting log.
- ⇒ 3.3.5. Discuss the benefits of using bug tracking software.
- ⇒ 3.3.6. Research and compare the pro's and con's of several specific bug tracking software solutions.
- ⇒ 3.3.7. Demonstrate the use of a debugger to inspect code at runtime.
- ⇒ 3.3.9. Create a cause and effect diagram to account for possible causes of a particular problem.



13.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ [CCSS.ELA-Literacy.RST.11-12.3](#) Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- ⇒ [CCSS.ELA-Literacy.W.11-12.2](#) Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
- ⇒ [CCSS.ELA-Literacy.W.11-12.4](#) Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience..

13.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
- ⇒ SCC03 PROBLEM-SOLVING AND CRITICAL THINKING: Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.
- ⇒ SCC10 TECHNICAL SKILLS: Use the technical knowledge and skills required to pursue the targeted careers for all pathways in the career cluster, including knowledge of design, operation, and maintenance of technological systems critical to the career cluster

13:D.4: 21st CENTURY SKILLS

- ⇒ Learning and Innovation
 - Critical Thinking and Problem Solving
 - Reason Effectively
 - Making Judgments and Decisions
 - Solve Problems
 - Communication and Collaboration:
 - Communicate Clearly
 - Collaborate with others
- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
 - Use and Manage Information
 - ICT (Information, Communications and Technology) LITERACY
 - Apply Technology Effectively
- ⇒ Life and Career Skills
 - Initiative and self-direction
 - Manage Goals and Time
 - Work Independently
 - Social and Cross-Cultural Skills
 - Interact Effectively with Others
 - Productivity and Accountability
 - Manage Projects
 - Produce Results



13.D.5: NEXT GENERATION SCIENCE STANDARDS (NGSS)

- NGSS: Asking questions (for science) and defining problems (for engineering)

13.E: ASSESSMENT REFERENCE GUIDE

13.E.1: DEBUGGING QUIZ - QUESTIONS

- Which type of error is caused when code is executed but there are undesired results?
 - Browser
 - Syntax
 - Runtime
 - Logic
- Define breakpoint and explain how they are used in debugging.
- Consider the following code. When running the code a warning is issued at line 11. What would the warning be?

```

public class A {
    2         public A foo() {
    3             if (flag)
    4                 return null;
    5             return new A();
    6         }
    7
    8         public void var() {
    9             A a = foo();
   10            if (flag)
   11                a.foo();
   12        }
   13
   14         private int flag;
   15     }
  
```



- Consider the code snippet below. The purpose of the code is to add the numbers from one to ten. The result when run is 0. Explain the error and how it could be corrected.

```

private void button1_Click(object sender, EventArgs e)
{
    int startLoop = 11;
    int endLoop = 1;
    int answer = 0;

    for (int i = startLoop; i < endLoop; i++)
    {
        answer = answer + i;
    }

    MessageBox.Show("answer =" + answer.ToString());
}
  
```

5. Identify the problem with the following code and offer a possible solution.

```
var list = new List { "burger", "and", "buns"
};
for (int i = 0; i < list.Count; i++)
{
    list.Add(list(i).ToUpper());
```

6. Explain the three main types of programming errors.

13.E.2: DEBUGGING QUIZ - ANSWERS

1. D
2. Marks a point in your code where the debugger will halt execution or “take a break.” Once you have placed a breakpoint, you can just run your application like you normally would. What happens now is that the application is executed just like normal, but as soon as a line with a breakpoint is reached, the execution is stopped right before that line would be executed. This allows you to see what values exist prior to that piece of code.
3. Possible null pointer exception.
4. The problem is an error in the logic - the loop never executes. The startLoop variable should be 1 and the endLoop variable 11.
5. This will create an infinite loop. Possible solution options are: Don’t modify the list you are working on, save list. Count to a variable and use that variable in the loop. Learner may come up with other alternative.
6. Compilation: errors that prevent your program from running. Typically caused by mistakes made when typing code.
7. Run-time: errors that occur while your program runs. These typically occur when the program attempts an operation that is impossible to carry out. Logic: errors that prevent your program from doing what you intended it to do. The code may compile and run without error, but the result of an operation produces unexpected results.



13.E.4: ASSESSMENT OF LEARNING OBJECTIVES

1. Given a test application containing at least 15 defects/inconsistencies, learners will identify the defects/inconsistencies and enter them appropriately into the bug tracking database.
2. Given a section of code with at least 15 bugs, learner will resolve the problems, updating their progress in the bug tracking database.

13.F: SUGGESTED RESOURCES

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

1. Software testing space <http://inderpsingh.blogspot.com/>
2. Quality Quality Assurance: A Methodology for Wide-Spectrum Game Testing
http://www.gamasutra.com/view/feature/132398/quality_quality_assurance_a_.php
3. Games Testing Methodology and Case Studies <https://sites.google.com/site/gametestingdkit/case-studies>



UNIT 14: PRINCIPLES OF VERSIONING AND GAME RELEASE



UNIT 14: PRINCIPLES OF VERSIONING AND GAME RELEASE

- 14.A: Unit Overview
- 14.B: Instructional Resource Guide
- 14.C: Learning Activities Guide
- 14.D: Standards Alignment Guide
- 14.E: Assessment Reference Guide
- 14.F: Suggested Resources

14.A: UNIT OVERVIEW

14.A.1: UNIT DESCRIPTION



Activities in this unit of study are designed to focus on the deployment of a custom game or interactive application as a final result (i.e. final product release) of the course.

14.A.2: MAJOR TOPICS

In this unit, learners will explore the following topics:

- Purpose for Game Versions
- Versioning (e.g. version names, numbering schemes)
- Managing Release Candidates

14.A.3: LEARNING OBJECTIVES

By the end of this unit, learners should be able to perform the following tasks:

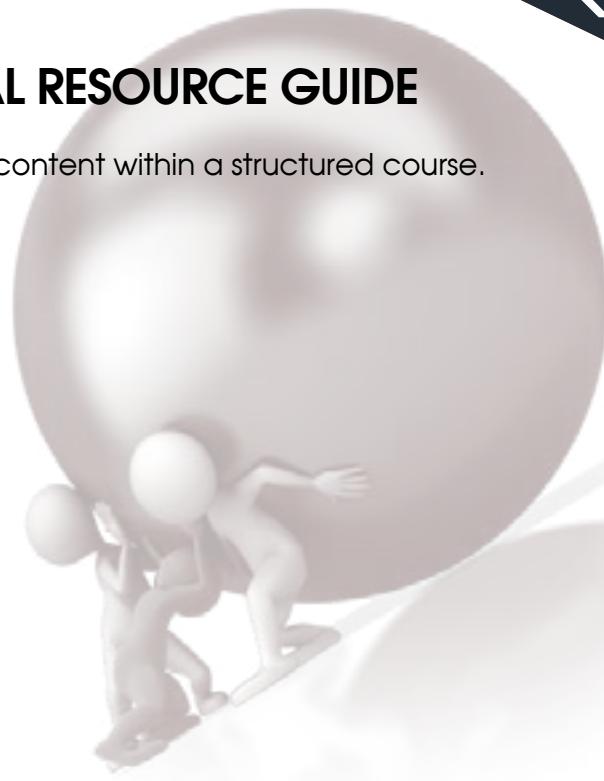
1. Explain the concepts and rationale behind versioning schemes and procedures
2. Describe how versions are used by different groups in the development process
3. Create a versioning system for a game development project
4. Utilize numbering systems to version complex development projects
5. Describe the factors that constitute a release candidate
6. Explain how versioning is used through each stage of a game
7. Explain how versions are used by different processes in the lifecycle of a game
8. Describe the various distribution options for release candidates

14.B: INSTRUCTIONAL RESOURCE GUIDE

This section provides a guide for delivering the unit content within a structured course.

14.B.1: COURSE OUTLINE

1. Version Names and Numbering Schemes
 - a. Development Stages
 - b. Numbering Schemes
 - c. Sequencing
 - d. Release Candidates
2. Purpose for Game Versions
 - a. Significance in Game Development
 - b. Significance in Technical Support
 - c. Significance in Marketing
3. Managing Release Candidates
 - a. Preparing for Official Release
 - b. Distribution
 - i. Options
 - ii. Process
 - iii. Shareware/For Profit



14.C: LEARNING ACTIVITIES GUIDE

This section provides a guide for delivering the unit content with integrated activities and assessments. When reviewing the content in this unit, important questions to consider may include:



- What learning experiences can your learners engage in during this unit?
- How can you integrate formative assessments into these learning experiences?
- How can you integrate formative assessments into the tangible deliverables (e.g. documents, projects, test applications, game builds) that your learners produce?
- How can you integrate summative assessments towards the end of this unit?

As these can be challenging questions, this section will provide resources and recommendations to help you determine the appropriate answers.

14.C.1: INSTRUCTOR-LED TRAINING (ILT) ACTIVITIES

14.C.1.A: 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.

14.C.1.B: 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.

14.C.1.C: Software Versioning Research Project

1

Open the website: http://en.wikipedia.org/wiki/Software_versioning and read all sections on software versioning.

2

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

3

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.

14.C.1.D: 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

14.C.1.E: Versioning Significance Narrative

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

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



14.C.1.F: Distribution Sources

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

14.D: STANDARDS ALIGNMENT GUIDE

14.D.1: PROFESSIONAL STANDARDS FOR INTERACTIVE APPLICATION AND VIDEO GAME CREATION

- ⇒ 3.2.1. Explain the stages of game deployment (Pre-Alpha, Alpha, Beta stages, Release Candidate, “going gold”, etc.).
- ⇒ 3.2.2. Explain how software versioning is used and why.
- ⇒ 3.2.3. Compare revision control software options and discuss pros and cons from several specific examples.
- ⇒ 3.2.4. Deploy, use and demonstrate a revision control system for a new or existing project.

14.D.2: COMMON CORE STATE STANDARDS (CCSS)

- ⇒ **CCSS.ELA-Literacy.RST.9-10.3** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
- ⇒ **CCSS.ELA-Literacy.RST.9-10.2** Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

14.D.3: STEM CAREER CLUSTERS (SCC)

- ⇒ SCC02 COMMUNICATIONS: Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.
- ⇒ SCC04 INFORMATION TECHNOLOGY APPLICATIONS: Use information technology tools specific to the career cluster to access, manage, integrate, and create information.

14:D.4: 21ST CENTURY SKILLS

- ⇒ Information, Media and Technology Skills
 - Information Literacy
 - Access and Evaluate Information
 - ICT (Information, Communications and Technology) LITERACY
 - Apply Technology Effectively
- ⇒ Life and Career Skills
 - Flexibility and Adaptability
 - Be Flexible



14.E: ASSESSMENT REFERENCE GUIDE

14.E.1: Versioning Research Project – Assessment Rubric



	Unacceptable	Basic	Proficient	Distinguished
Research	Incomplete and unrelated content included in the narrative. Multiple grammatical errors found.	Very simple description of versioning, numbering schemes and sequencing. Some grammatical errors found.	Concise description of versioning, numbering schemes and sequencing and how they are effective in management of developing a game. Details offered on numbering schemes, and good insight offered on how versioning is important to overall development process. Few grammatical errors found.	Very complete and well developed description of versioning, numbering schemes and sequencing and how they are effective in management of developing a game. Details offered on numbering schemes, and good insight offered on how versioning is important to overall development process. No grammatical errors found.
Narrative	Limited view on how versioning impacts other parts of the build process. Grammar issues limit understanding of narrative concepts covered.	Basic view on how versioning impacts other parts of the build process. Some grammar issues impact understanding of narrative concepts covered.	Concise view on how versioning impacts other parts of the build process. Few grammatical issues and minimal impact to understanding of narrative.	Very complete and expanded view on how versioning impacts other parts of the build process. No grammatical issues. Each area of impact fully addressed and document is very informative on why versioning is important.
Mechanics: spelling, grammar, punctuation	Paper has 7 or more errors.	Assignment has between 5 and 6 errors.	Assignment is proofread well, with only 3 or 4 errors.	Assignment has been thoroughly proofread and contains no more than 2 errors.
Distribution Sources:	Only a few sources listed, no links or information provided.	Several sources and/or a few links are listed.	Several sources listed, overview of options and services is complete with links and options.	Several sources listed, overview of options and services is complete with links and options along with comparisons of different sources and advantages of each.

14.E.2: ASSESSMENT OF LEARNING OBJECTIVES

1. The learner will be able to compare and contrast the various types of versioning.
2. Within a written document, the learner will summarize major concepts related to game versioning.
3. Within a written document, learners will summarize the significance and importance of versioning to members of a design team, a technical support team, and a product marketing team.
4. The leaner will be able to define the following terms:
 - Pre-alpha
 - Alpha
 - Beta
 - Release Candidate
 - Versioning Numbers
 - Commercial Distribution
 - Shareware
5. Learners will be able to produce a master list of resources for distributing games and applications



14.F: SUGGESTED RESOURCES

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

1. Mastering Unity Project Folder Structure - Version Control Systems <http://unity3d.com/learn/tutorials/modules/beginner/architecture/folders-in-version-control>
2. Software Versioning http://en.wikipedia.org/wiki/Software_versioning
3. Just Enough Project Management: The Indispensable Four-step Process for Managing Any Project, Better, Faster, Cheaper <http://www.amazon.com/Just-Enough-Project-Management-Indispensable/dp/0071445404>
4. Version Control by Example <http://www.amazon.com/Version-Control-Example-Eric-Sink/dp/0983507902>



CAPSTONE PROJECT



CAPSTONE PROJECT

- 1.A: Overview
- 1.B: Submission Requirements
- 1.C: Milestones
- 1.D: Final Deliverables
- 1.E: Dependencies
- 1.F: Task Breakdowns
- 1.G: Timeline
- 1.H: Standards Alignment
- 1.I: Assessment

1.A: OVERVIEW

Purpose

The purpose of the *Capstone Project* is to gain experience in taking an original game through the entire process: from concept to completion. Each learner will work on their *Capstone Project* throughout the year, culminating in a complete game design for their graduation portfolio. During the first week of class, learners should begin generating core ideas for games. Don't stress them, however! These do not need to be fully developed ideas, just "seeds" for their imagination. Later, each learner will choose one of these ideas as the basis for their *Capstone Project*. As the course progresses through the units of study, learners will begin to create the elements that will grow into their *Capstone Project*.

Learners should keep the following Big Three Questions in the front of your mind:



- 1
- 2
- 3

- What do they want to accomplish with this game?
- What do you need to accomplish to complete the *Capstone Project*?
- When do they have to submit the completed project?

Learners may work in 1, 2, or 3 person teams to create their game. If they choose to work in a team, their project should be graded as a team. At the end of the year, the instructor should ask each learner how much each team member contributed, including themselves. Lack of participation will result in a lower grade for that team member. Great teams have great contributors, each contributing equally.

Learners should think carefully about their team members: Will it be possible for their team to meet on a regular basis? What skills do the different individuals bring to the team? (e.g. art, design, programming, testing, project management)

Learners should be encouraged to form a heterogeneous team made up of individuals with varying types of skills.

And lastly, there is one very important concept to covey:

**An organized project =
a happy game developer!**



1.B: SUBMISSION REQUIREMENTS

Requirements for submission of the *Capstone Project* include:



- An instructor approved *Capstone Project* proposal.
- An instructor approved Milestone Sign-Off Form.
- An original interactive application or video game.
- Game must include story and characters.
- An opening screen that states the title and explains the rules and instructions for playing.
- Graphics in support of the story and the gameplay.
- Player progress tracking throughout the game (e.g. player score, health meter, time limit).
- Challenging, but not impossible gameplay.
- Level of difficulty increases as the game progresses (e.g. multiple levels, objects to collect, more enemies, challenge of enemies).
- Multiple, original pieces of artwork (e.g. images or drawings).
- Multiple, original sounds created by the learner; at least one music clip and one player activated sound.
- Three game levels.
- More than one kind of movement property.
- A separate win screen and lose screen (not just a message).

1.C: Milestones

Project Phases & Primary Deliverables

Listed below are the three project phases and their primary deliverables:

1

Project initiation: Creating the idea.

⇒ Primary Deliverable: *Game Pitch Proposal*

2

Pre-Production: Refinement of the game concept.

⇒ Primary Deliverable: *Game Design Document (GDD)* that includes:

- Story creation
- Character design and development
- Game object design and development
- Level design and layout
- Rule development
- User interface design
- Sound design

3

Production.

⇒ Primary Deliverable: Game prototype (i.e. a working version of the game).

The game may not have all the bells and whistles, but a user can play from start to finish.

Milestone Sign-Off Form

Utilize the form below to receive instructor sign-off on the milestones for your Capstone Project:

Milestones For Capstone Project	Suggested Unit Association	Sign-Off
Game Proposal Draft Outline	Unit 3	
Initial Project Charter	Unit 3	
Storyboard Draft	Unit 4	
Character/Lead Object development	Unit 4	
Work Breakdown Structure	Unit 4	
Final Project Proposal	Unit 5	
Game Design Matrix draft	Unit 6	
Unity Game Demo (draft)	Unit 8	
Capstone Versioning Record	Unit 8	
Level Design Draft (3 levels descriptive and sketched)	Unit 9	
Unity demonstration of levels (at least 2)	Unit 9	
Atmosphere description and mood board	Unit 10	
Project Control Plan Progress	Unit 10	
Sound Plan Draft	Unit 11	
User Interface draft (sketches)	Unit 12	
Test Plan draft	Unit 13	
Final Game Design Document, Working copy of your game, all project management documentation	Unit 14	
15 minute Presentation	Unit 14	

1.D: FINAL DELIVERABLES

1

A Game Pitch Proposal: This is a 9+ page document that is a learner's statement of work, against which their *Capstone Project* will be graded.

2

A well-defined *Game Design Document (GDD)*: This will be a 15+ page document that each learner will complete for their game. Learners are expected to work on this document throughout the course as the instructor teaches different aspects of game development.

3

A set of printouts depicting models and levels; sufficient to show that the game design is functional. These documents should be included in the *Game Design Document (GDD)*.



1.E: DEPENDENCIES

This is where learners should note which of the milestones require the completion of other milestones in order to be successful. For example: developers need to know their storyline before designing their levels. Think about what game developers need to know and have accomplished in order to achieve each milestone.

1.F: TASK BREAKDOWNS

The *Task Breakdown* should include all tasks that a game team (i.e. group) can foresee in the creation of their game. Each task should have a detailed description of the task to be accomplished. Items that are likely to be listed include:

- Creating artwork
 - Creating or finding the soundtrack
 - Preliminary level design
 - Writing code
 - Regular group meetings (if working in a team)
- An illustration of a clipboard with a checklist. The clipboard has a white sheet of paper with several checkmarks in boxes. The clipboard is tilted slightly.
- Submitting the functional prototype of a game
 - Writing the progress report for a game
 - Play-testing of a game
 - Tuning the play of a game
 - Writing the final documentation for a game

Examples of tasks with descriptions include:

- Create sprites/avatars: Use Google SketchUp to create the artwork for the game sprites, including the giant cockroaches and mutant mice.
- Create sound effects for battle scenes with giant cockroaches.

1.G: TIMELINE

Learners develop and manage their timeline by referencing the Milestones, the *Task Breakdowns*, and the units of study. Learners should pace themselves carefully. If they finish their work deliverables on an ongoing basis, they should be able to submit a complete *Capstone Project*. Be sure learners leave time in their schedule to resolve issues that surface during the development process.

1.H: STANDARDS ALIGNMENT GUIDE

The Capstone Project should align to the following standards initiatives:

1.H.1: NEXT GENERATION SCIENCE STANDARDS (NGSS)

- ⇒ HS-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- ⇒ HS-ETS1-1: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- ⇒ HS-ETS1-1: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
- ⇒ HS-ETS1-1: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.



1.I: ASSESSMENT RUBRICS

Assessment rubrics are provided for the following components of the Capstone Project:

- 1.I.1: Game Pitch Proposal
- 1.I.2: Game Requirements and Content
- 1.I.3: Game Design
- 1.I.4: Final Game Product Submission

1.1.1: Game Pitch Proposal – Assessment Rubric



	Distinguished	Proficient	Unsatisfactory
Executive Summary	Includes Game Name, Basic Idea, Audience, Target Market, Character, GamePlay and World Design, Team Members	Includes all the topics but some are incomplete.	Does not include all the required topics.
Sketches Drawings are critically important	Includes excellent primary sketches of level layouts, characters, menus, and world objects.	Includes sketches of level layouts and characters	Is missing either the level sketches or both.
Detailed game components	Includes thorough descriptions for The quest Main Characters Opponents Environment Menus Controls Sounds	Contains description of all the required items but with insufficient detail for some.	Missing more than of the required description categories and/or insufficient detail for 3 or more of the descriptions if provided.
Summary	Includes strong sales pitch that would entice all audiences to play the game.	Good sales pitch. Would entice the games target audience.	Basic description of game.

1.I.2: Game Requirements and Content – Assessment Rubric



	Distinguished	Proficient	Unsatisfactory
Creativity, Originality	Game is creative and original, and shows time spent.	Game shows evidence of creativity and originality.	Game is a copycat of some popular game.
Naming Conventions	Game items are named with prefixes and name reflects content. Prefixes include spr, snd, back, scr, font, obj, and room	Most game items are named correctly.	Game names are not specific or do not use prefixes.
Game Info Screen	Includes game name, your name, how to play, rules, scoring	Missing 1 item.	Missing 2 or more items.
Multimedia	Includes background image, background music and sound effects.	Missing 1 item.	Missing 2 or more items.

1.1.3: Game Design – Assessment Rubric



	Distinguished	Proficient	Unsatisfactory
Game Design	Overall game design is excellent with game world, characters and interactions.	Game design is good.	Game design is average.
Character Design	Characters are appropriate to game, and are high quality, and move correctly.	Characters may not be in scale to each other, medium quality sprites.	Stickmen characters or low quality sprites.
Game Play Interface	Game play interface is intuitive and easy to understand.	May need to read info screen to understand how to play the game.	Game play interface does not follow standard conventions.
Game Play	Characters interact correctly with world. Interactions and collisions work correctly and as expected with all game objects.	Characters work correctly except for the occasional glitch.	Characters don't work correctly either within the world, or with other game objects. Multiple problems with play.
Scoring	There is an obvious way to progress from level to level. It may be lives, points or achieving some level objective such as reaching the exit.	There is a way to progress from level to level, but it is not obvious by playing the game. You should understand by reading the Info screen.	There is no way to progress from level to level, or there is only one level.
Level Design	There are at least 3 different levels and they progress in difficulty but are still winnable.	There are at least 3 different levels but a player has difficulty winning a level.	There are only 1 or 2 levels in the game.

1.1.4: Final Game Product Submission – Assessment Rubric



Game Feature	Unsatisfactory	Basic	Proficient	Distinguished
Levels Students must create 3 levels for their application or game, complete with background, obstacles, collision artifacts, sound, etc. The 3 level requirement does not include start or splash screens, level summaries or over/end of game screen.	Game includes less than 3 levels. Rooms also do not include sound, collisions, obstacles, artifacts. Game does not include a start screen or an end screen	Game includes 3 or more levels that include sounds, artifacts, obstacles and collisions. Game includes start and end screens.	Game includes 3 or more levels that include sounds, artifacts, obstacles and collisions. Game includes start and end screen. Game includes 3 or more complex sounds, artifacts, obstacles, graphics and multiple collisions. Levels show progressively increasing complexity and/or difficulty.	Game includes 3 or more levels that include sounds, artifacts, obstacles and collisions. Game includes start and end screen. Game includes 3 or more complex sounds, artifacts, obstacles, graphics and multiple collisions. Levels show progressively increasing complexity and/or difficulty.
Background Artwork The backgrounds must be completely created by the individual designer. The backgrounds cannot come from the web, a code pack or resource file. The backgrounds must be your own work designed in Photoshop, Illustrator, or Paint.	Game includes no author created backgrounds.	Game includes 1 author created background or 2 modified backgrounds from a code pack, game pack or from the web.	Game includes 3 basic backgrounds created by the author in Illustrator, Photoshop or Paint. Backgrounds are saved as an individual files separate from the project file.	Game includes 3 or more complex author created backgrounds. Backgrounds are saved as an individual file separate from the project file.
Start Screen The Start Screen must be completely created by the individual designer. The start screen cannot come from the web, a code pack or resource file. The start screen must be original work.	No start screen was created.	A basic start screen was created however buttons do not work or were not included in the start screen	Start screen includes functioning buttons such as INFO, Start Game, etc. Buttons take players out to additional screens	Start screen includes functioning buttons taking players to additional screens. In addition, complex info, start and end screens have been designed. Start screens includes animation.
Info Screen All games must contain a designer created info screen which describes the rules of the game and any game play moves (key presses, mouse clicks) unique to the game. This must be accessible from the game start screen.	No Info screen was created.	A basic info screen was created, however instructions did not help the player with questions about the game.	A basic info screen was created however, the instructions for the player were poorly written, and did not help the player understand how to play the game	A complex info screen was created, helping the player understand game play.

1.1.4: Final Game Product Submission – Assessment Rubric

Game Required Elements Programming



	Unsatisfactory	Basic	Proficient	Distinguished
Collision Event Game has 1 or more collision events programmed on an object.	No collision event Collision event programmed incorrectly	Collision event programmed correctly	Collision event programmed correctly	Multiple collision events or triggers for other actions. Additional scripting to create a collision. Step or variable controlled collision event.
Jump/Gravity Event A jump or gravity event applied to a game object.	No Jump/Gravity Event Jump/Gravity event programmed incorrectly	Jump/Gravity event programmed correctly	Jump/Gravity event programmed correctly	Multiple jump/gravity events or triggers for additional actions. Additional scripting added to create or control jump/gravity event. Step or variable controlled jump/gravity event
Key Press Event Event controlled by key press or keyboard command.	No Key Press or keyboard events Key Press or keyboard event programmed incorrectly	Key Press or keyboard event programmed correctly	Key Press or keyboard event programmed correctly	Multiple Key Press or keyboard events or triggers for additional actions. Additional scripting added to create or control Key Press/Keyboard event.
Scoring/Health Event Health or Scoring occurs in the game.	No Health or Scoring event Health or Scoring event programmed incorrectly	Health or Scoring event programmed correctly	Health or Scoring event programmed correctly	Complex Health or Scoring events or triggers for additional actions. Additional scripting added to create or control Health/Scoring event.

1.1.4: Final Game Product Submission – Assessment Rubric

Game Required Elements Game Play



	Unsatisfactory	Basic	Proficient	Distinguished
Game Play Game play takes into account how the game plays, if the rules are followed in the game play by the designer and how well the game plays out for a new player. Do problems with the code prevent the game play from proceeding, scoring, etc. How satisfied are new players with the game.	Game does not play well. Error Codes prevent game from opening.	Game has programming problems preventing smooth play	Game meets basic requirements for play. No code errors.	Game has good play, good action. No code errors. Consistent play throughout game.

1.1.4: Final Game Product Submission – Assessment Rubric

Game Required Elements



	Unsatisfactory	Basic	Proficient	Distinguished
Game Craftsmanship Game Craftsmanship looks at the game holistically; graphics, sprites, rooms and backgrounds, how well they work together and how they create the game play experience.	Game is poorly crafted. Game play is unexciting. Game has no educational value	Game has some interesting elements. Game play is slow and players soon lose interest in the game. Game has a basic educational value	Game has interesting and challenging elements. Game play is fun and players enjoy the game. Game has incorporated learning into game play.	Game has many interesting and challenging elements. Game play is exciting and players want to keep playing. The game has incorporated learning into game play and the outcome of the game is focused on education.

1.1.4: Final Game Product Submission – Assessment Rubric

Game Required Elements Work Ethic and Presentation



	Unsatisfactory	Basic	Proficient	Distinguished
Work Ethic	Student rarely used class time to work on project. Student was continuously redirected to return to work on project. Student rarely brought materials they needed to class to complete project.	Student occasionally used class time to work on project. Student needed numerous prompts to return to work. Student was disorganized, did not bring files or flash drive on numerous days to complete project.	Student was organized, brought files to class and worked steadily and consistently on project. Student did not need prompting to remain on task.	Student was well organized and well prepared to work on project every class period. Student used class time to enhance their project and kept improving the project up to the deadline. Student was on task without prompting.
Presentation	Student did not present project to the class.	Student presented project, however, student was unprepared and did not guide the audience through the high points of the game. Student did not actively listen to other students as the presented. Student did not offer comments or offered inappropriate comments on other student's games.	Student developed an interesting presentation for their game. Student actively listened to other presentations. Student added appropriate and substantive comments on other student's games.	Student developed an interesting and compelling presentation. Student actively listened to other presentations. Student added appropriate and substantive comments on other student's games.

RESOURCE GUIDE



RESOURCE GUIDE

- ⇒ Glossary
- ⇒ Reference Documents / Templates
 - Game Developer's Journal
 - Game Design Document (GDD)
 - Game Design Document (GDD) Template
 - Game Modification Plan
 - Game Modification Task Sheet
 - Game Pitch Proposal
 - Work Breakdown Structure (WBS)
 - Project Charter
- ⇒ Miscellaneous Technical Web Resources
 - Unity Game Engine / Game Editor Software
 - Unity Learning Materials and References
 - Unity Game Assets and Program Extensions
 - (Supplemental) Art, Modeling, and Asset Creation Software Products
 - Textures Assets
 - Audio Assets
 - Model Assets
 - (Supplemental) Bug Tracking Software Products
- ⇒ Sample Diagrams and Matrices
 - Interaction Matrices
 - Class Diagrams
 - Game Flow Diagrams
- ⇒ Miscellaneous Game Industry Information
 - Taxonomies
 - Genres
 - Elements
 - Contents
 - Themes
 - Styles

GLOSSARY

TERM

TERM	DEFINITION
Bug Tracking List	Records the problems or issues encountered within an interactive application or video game.
Capstone Project	Final culminating project, typically executed in the final period of study. Also referred to as a keystone project.
Concept Document	Utilized to introduce stakeholders to the intended game and initiate (i.e. "greenlight") the game development process. Also referred to as the high level concept document or the concept proposal document.
Game Design Document (GDD)	Serves as the primary design blueprint for a game. The Game Design Document (GDD) often encompasses many sub-documents, including, but not limited to: <ul style="list-style-type: none"> • Art Document • Concept Document • Technical Design Document (TDD)
Game Developers Journal	Serves to organize and record the development process from an individual's perspective.
Game Flow Diagram	Provides visual documentation of a game design. The Game Flow Diagram is helpful in analyzing the relationships between objects in a game.
Game Objective	Something a player is trying to do or achieve in a game; a goal or purpose.
Learning Objective	Brief statements that describe what individuals will be expected to learn by the end of a finite period of study.
Mechanics-Dynamics-Aesthetics (MDA)	A tool used to analyze games.
Project Charter Form (PCF)	Serves as an internal document that captures high level planning information (scope, deliverables, assumptions, etc.) about the project.
Technical Design Document (TDD)	Serves as the primary technical blueprint for a game.
Work Breakdown Structure (WBS)	In project management, a Works Breakdown Structure (WBS) is a deliverable-oriented decomposition of a project into smaller components. A work breakdown structure element may be a product, data, service, or any combination thereof.

GAME DEVELOPER'S JOURNAL

Why produce a Journal?

The Merriam-Webster dictionary defines strategy as: "a careful plan or method for achieving a particular goal usually over a long period of time." Industry veterans typically state that good games require a sound strategy for success.

Good project management is no different! Maintenance of the Game Developer's Journal serves to keep developers focused and on track while also offering management (i.e. your instructors) ongoing insight into your daily progress.

The Game Developer's Journal will serve as physical, written evidence of the strategic thinking, hard work, personal creativity, and technical prowess that you have completed in your studies.

What should the Journal look like?

The journal should be treated like an important, valuable, yet unique resource. As such, it should be a well protected and personalized asset for you.

- **Protect it!**
The journal should have a hardcover to protect it from the weather/elements.
- **Bind It!**
The journal should be bound, like an artist's sketchbook, but also have folder pockets capable of collecting loose papers, handouts, napkin sketches, game advertisements, and anything else that helped you during the game development process.
- **Personalize it!**
The paper in the journal can be lined or unlined, whichever you prefer. It can include colors, pictures, drawings, and doodles if you like (or) be crisp and professional like a legal document. It is your resource, you decide!

What should the Journal include?

Game developers need to keep their eyes on the prize! The journal is your collect-all and fail-safe to ensure this happens. As such, be sure you:

1. Record all your ideas and state how you got them. What was your inspiration?
2. Write about the challenges you experienced during the process and how you resolved them.
3. Do not erase notes or entries, but revise and expand upon them.
4. Add sketches and drawings to make things clear.
5. Put a date each time you start a new entry. This will help you track progression.
6. Jot down your ideas and sketch them out when appropriate. Sometimes it is easier to draw pictures that illustrate the connections between ideas, sequences, or events.

And lastly, it is best to ensure the Game Developer's Journal records your entire process. As such, be sure you:

1. Keep your journal with you as much as possible in order to capture your ideas promptly.
2. Share your journal entries with your instructors and peers in order to receive feedback and tips.

Below are examples of typical entries within the Game Developer's Journal:



February 27, 2015: My game design teacher reviewed the Project Charter Form (PCF). I now understand why this document is import to the game design process. Moving forward, I will create and update a PCF for my capstone project.



February 28, 2015: Played a new strategy game recommended by some friends from my science club. The name of the game is... (details omitted)

- I liked...(details omitted)
- I disliked...(details omitted)
- I would change...(details omitted)



March 1, 2015: Attended the Game Developers Conference (GDC) in San Francisco, California. There was so much to see and do. What an amazing experience! I picked up some Unity 3d brochures and placed them in my folders.

REFERENCE DOCUMENTS / TEMPLATES

GAME DESIGN DOCUMENT (GDD)

This Game Design Document (GDD) is comprised of three parts. Each of which the learner can utilize individually or as a whole. The three parts include:

- ⇒ Concept Document
- ⇒ Design Document
- ⇒ Technical Document

Instructions:

Introduce the learner to the Game Design Document (GDD) early in the learning process. In this way, learners can use it as a reference tool and begin to document their plans in preparation for the *Capstone Project*. A template version of the Game Design Document (GDD) begins on the next page so the instructor may easily separate and distribute it.

GAME DESIGN DOCUMENT (GDD) TEMPLATE

Concept Document

The concept document serves the purpose as a way to present a game concept. A general overview of the game, with the idea anyone can read and understand what the game is like. This part of the document is one that will change very little once the concept is accepted.

Title Page

The title page includes general information about the game:

Game Name :
Game Logo :
Game Catch Phrase :
Document Type :
Document Version :

Credit Page

The credit page should present information about the person who authored the document and for what company.

Document Purpose:
Document Version:
Working Title:
Game Concept:
Game Document Author:

Sign-Off

The sign-off section lists all the people involved (by rank and role) and confirms that each member of the team has read through the document and agrees with the current plan.

GAME CONCEPT SIGN-OFF

Lead Artist:

Lead Designer:

Lead Programmer:

Lead Producer:

Introduction

The introduction should include a brief sentence or two about the game, its genre, player type, technical form, references and theme. Everyone that reads this should be able to understand what the basic idea of this game is.

A new purpose for the introduction can also be the reason for the concept and history of the game the concept is based upon. Here is a short list of subjects to address in the introduction:

- Genre
- Player Type
- Game Play
- Technical Form
- History
- Reference
- Theme
- Design Intentions (original or cloned)

Game Analysis

The game analysis provides a general overview of the game.

GAME DESCRIPTION

Genre:

- Describe the Genre

Example:

- Role-play
- Adventure
- Strategy
- Puzzle
- Simulator
- Construction & Management

Game Elements:

- Game elements are the basic activities the player will be doing for fun during the game.

Example:

- Shooting
- Collecting
- Chase
- Combat
- Dodging

Game Content:

- Example:

- Horror
- Thriller
- Humor
- Drama

- Theme:
- Example:
 - Western
 - Sci-Fi
 - Fantasy
- Style:
- Example:
 - Real
 - Old School
 - Manga
- Game Sequence:
- Example:
 - Linear- Storylines
 - Hyper- Storylines that the player can influence
 - Simulation
- Player:
- The Number players that can play the game at once

GAME REFERENCE

- Game Taxonomy:
- Game Taxonomy is here as a reminder of what the design direction is.
 - Game Taxonomy is made up of **Simulation-**, **Game-** and **Narrative-based**. These can further be divided into Chance vs. Skill, Fiction vs. Non-Fiction and Physical vs. Virtual. Based on Lankoski and Björk: "Lindley (2003) slightly modifies Caillols' (1961) classical four elements... identifying three primary descriptors (narrative, ludology, and simulation), upon which operate additional dimensions differentiating the level of chance vs. skill, fiction vs. non-fiction and physical vs. virtual.
 - Example: Xyanide is a Fictional Game/Narrative, while Sim City is a Non-Fictional Simulation/Game.
- Player Immersion:
- This is an attempt to understand what kind of enjoyment the player will receive from the game.
Example:
 - Tactical
 - Strategy
 - Narrative
 - Physical
 - Emotional
 - Mental

- Reference:
- References can come from anywhere.
 - The idea is to describe your game's story, play, and style with references.

GAME TECHNICAL

- Technical Form:
- Basically there is 2D graphics (Flat) and 3D graphics (Form)
- View:
- Camera view the player will experience the game from
- Platform:
- iOS, Android, Mac, PC
- Language:
- C#, C++, Ruby, Java
- Device:
- PC, Mobile, Console

GAME SALES

- Consumer Group:
- This could involve conducting a research or focus group with actual consumers to gather or validate market acceptance data
- Payment:
- This could involve discussions on monetizing the game and receiving payments from customers
- Estimated Price:
- This could involve market sizing and market pricing strategies for the game product
- Atmosphere Mood Board
 - Character/Units Sketch & Description
 - A Level (Locations) Sketch & Description
 - Audio Description

Game Atmosphere

In the game atmosphere section, it is best to have a mood board or a clear description of the game's style. This is a good place to start interacting with a graphic designer.

Game Play

The game play section is utilized to create a descriptive paragraph about how the game is played. The idea is that you want the person imagine they are actually playing the game. Try not to use generic (i.e. broad, non-descriptive) names when writing about the game play.

- Opening the game application
- Game Options
- Story Synopsis
- Modes
- Game Elements
- Game Levels
- Player's Controls
- Winning
- Losing
- End
- Why is all this fun?

Example: Few readers want to hear statements such as: “enemy_1 will have more hit points than enemy_2.” Instead, it is better to make statements such as: “the Lazarus Fighter has more armor than the Apollo Fighter.”

- Number of Levels
- Number of Enemies/ Characters (*Example: 12 characters or amount of enemies, end bosses*)
- Time of Game Play (*Example: 2 hours of fun*)
- Replay ability
- Audio Specifications
- Graphic Specifications
- Device Compatibility
- Number of Players
- Online Activities (high scores, etc.)
- Number/Type Modes

This outline will vary according to the type of game.

Key Features

Key features are a list of game elements that are attractive to the player. It may be a good idea to research the key points below or consult with a professional marketer.

- Marketing Ideas
- Consumer Group
- Unique Features
- Merchandising

Selling Features

This is a list of features that could be potentially helpful to market and/or sell a game. If a game has any copyrightable material, note it here. It may be a good idea to research the key points below or consult with a professional marketer.

Design Document

This document describes how game objects behave, controlled and properties they have. This is often referred to as the “mechanics” of the game. This documentation is primarily concerned with the game itself. This part of the document is meant to be modular, meaning that you could have several different Game Design documents attached to the Concept Document.

Design Version

A version can single out a certain series of devices that may have limitations, different OS or more advanced features. A code convention for different versions would be advisable.

Example: Such as J1.1

(J): (JAVA) Developed for a particular Technology

(1.): Concept Update

(.1): Content Update

Design Guidelines

This is an important statement about any creative restrictions that need to be regarded and includes brief statements about the general (i.e. overall) goal of the design.

- Menu
- Synopsis
- Game Play
- Player Control
- Game Over (Winning & Losing)

Game Design Definitions

In this section, the definition of the game play is established. Definitions should include how a player wins, loses, transitions between levels, and the main focus of the gameplay.

Issues that should be addressed here are:

Game Matrix

The game matrix is a spreadsheet containing the generic names of the player and antagonistic elements and their game properties. This should allow an easy cross reference for any elements in the game that have numerical or other descriptive values associated with their name.

Game Flow Chart

The game flow chart provides a visual of how the different game elements and their properties interact.

Game flow charts should represent Objects, Properties and Actions that are present in the game.

Flow chart objects, properties and actions should have a number reference to where they exist with in the game mechanics document.

Player Elements

The player elements section lists all the elements that are directly related to the player or serve to benefit of the player.

Devise two sets of names for player elements. One set is a generic name (or code) and the other is its game name. Describe the terminology that you use to describe the player's properties.

This is a good place to interact with a graphic designer to ensure the game graphics match the game names. Graphics that will be seen during game play should be exhibited here.

Multi-player issues should also be mentioned here.

- Default (Status): What are the default settings for the player at the beginning of the game or level?
- Actions: What can the player do?
- Information (Status): What information about the game is available for the player?
- Default Properties: How does the player begin the game?
- Winning: How can the player win?
- Loosing: How does the player lose?

Player Definition

Use the player definition section to make quick descriptions that define the player.

Below is a suggested list of player definitions:

Player Properties

Make a list within the player properties section that defines the properties for each player. Player properties can be affected by player's action or interaction with other game elements. Define the properties and how they affect the player's current game.

A suggested list of player definitions may include:

- Health
- Weapons
- Actions
- Etc.

Each property should mention a feedback as a result of the property changing!

Player Rewards (Power-ups & Pick-ups)

Within the player rewards section, make a list of all objects that affect the player in a positive way. (i.e. health replenished)

Define these objects by describing what affect they cause and how the player can use the object.

User Interface (UI)

This is where a description of the user's control of the game can be placed. It is also recommended to think about which buttons on a device would be best suited for the game. Consider what the

worst layout is, then ask yourself if your UI is still playable?

A visual representation can be added, where we relate the physical controls to the actions in the game.

When designing the UI, it may be valuable to research quality control and user interface (UI) design information.

Heads up Display (HUD)

The HUD section is where a description of any graphics that will represent information during game play should be described.

A visual representation (mock-up screenshot) here would be useful.

This is another good place to seek the advice or collaboration of a graphic designer.

Player View

A screen shot is very necessary in the player view section.

It is also beneficial to include a definition of how the camera moves for the player.

Finally, a (mock-up) overview of the level relative to the screen size will help create a perspective of a levels size compared to what is actually seen.

Antagonistic Elements

This is where a list of antagonistic (i.e. enemies, opponent) objects should be listed with graphics and written description.

Describe the terminology that you used to describe antagonistic properties.

Devise two sets of names for player elements. One set is a generic name (or code) and the other is its game name.

This is another good place to collaborate with a graphic designer to ensure the game graphics match the game titles, names, and descriptors.

Antagonistic Definitions

This where a description goes of what makes an antagonistic element.

Antagonistic Properties

This is a list of properties that antagonistic elements have in common.

Antagonistic List

This is where a list of all the antagonistic elements goes.

Artificial Intelligence (AI)

This is where visuals and written description(s) of the antagonistic element's behaviors. These should be labeled in such a way that they can be used in level design without having to describe them again.

Devise generic names for repetitive behaviors.

This is how an AI action could be deconstructed:

- Normal State: What is the object doing if it has not come in contact with the player?
- Detection State: What does it take for this object to detect the player?
- Reaction State: What does the object do as an action after passing the reaction state?
- End State: What happens to the object after player has reacted correctly or incorrectly to object?

Global Game Elements

In this section, it is important to describe the boundaries, neutral objects, camera views and scale of the world.

Neutral game world objects can be things like a static background, objects that do not interact with the player or antagonistic elements.

The Story

This is where the story can be described in detail. A story board can be used to tie in graphics to the text. This can later be used for splash screen concepts.

The Story Copy

A shorter version of the story (the in game version) should also be written here. This is where the script for in game characters or story information during the cut scenes would be placed. This category does not always pertain to the current Game Design.

Concept Art

Sketches that are used for the concept can go into this section as visual reference. In the case of a brand, certain creative restrictions should be noted here. This is a good place to collaborate with a graphic designer to ensure game graphics match game names.

Level Design

This is where information pertaining to level design and visuals of the level design goes. Level design can best be shown as a flow chart. Use generic names to create level design.

Level Copy

This is where the script for in game characters or story information during the cut scenes would be placed.

Audio & Sound F/X

This is where game audio and Sound F/X should be listed, first with generic names and then described. This section also includes deciding if you will use a device's vibration ring mode.

Game Architecture

The game architecture section is best produced using a flow chart to represent the overall game. Be sure to identify (i.e. name, number) each screen.

- Title Screen

- Option Screens
- Game Modes
- End Screens

Game Architecture Overview

The splash screens or video clips need to be in accordance to game story and style. If cut scenes use video then story boards should be created.

Menus should be designed with the most important options easily accessible. Be aware how many clicks it takes to accomplish a task.

The game instructions should be written so that the player understands how to play the game.

Mock-ups should be made so that the game programmers get the correct layout of the menu.

It is a good idea to mention and describe the high score screen in this section.

Architecture Copy

All text from the game can be compiled here.

Review the Game Architecture Overview section.

How To Play Copy

This section will organize the game copy. The game copy includes information for the player, clearly describing how to play the game.

Technical Document

The information concerning the technical aspects of the game should be placed here. The technical document is best achieved with consensus from the people responsible for the Visual, Programming, and Audio aspects. This part of the document is meant to be modular. This means that it is possible to have several Game Technical documents attached to the Game Design Document (GDD).

System Requirements

This is a list of system requirements that a device will have to meet to run the game.

This also represents the restrictions that may apply to the end product.

Visual Content

A list of technical requirements from those concerned with the visual aspects of the game. All objects should be listed with their generic names.

- ⇒ General
 - File Size Restrictions
 - File Format Type
 - File Quality Type
 - Visual Scale
- ⇒ Player Elements
 - Type of States (Default, Damage, Destroyed, ect.)
 - Amount Animation Frames
- ⇒ Heads Up Display (HUD)
 - Type Icons
 - States
 - Font Type
- ⇒ Antagonistic Elements
 - Type of States (Default, Damage, Destroyed, ect.)

- Amount Animation Frames
- ⇒ Global Elements
 - Background/Texture/Tiles
 - Font Type

Audio Content

This is the section for organizing the audio content. It is very important to communicate with the audio designer before and while the audio content is being developed.

- ⇒ General
 - File Size Restrictions
 - File Format Type
 - File Quality Type
- ⇒ Player Elements
 - Type of Sound f/x
 - Device Vibration
- ⇒ Antagonistic Elements
 - Type of Sound f/x
 - Device Vibration
- ⇒ Global Elements
 - Ambient Music
- ⇒ Splash Screens
 - Ambient Music
- ⇒ Menus
 - Type of Sound f/x

Programming Content

The programming content section should help permit good collaboration with the programmer. The objective of this section (and task) is to try to organize and modulate as much as possible.

- ⇒ General
 - Requirements
 - File Size Restrictions
 - File Format Type
 - Specify Coding Conventions
 - Language/Device Restrictions
 - Screen Type (Small, Medium, Large)
- ⇒ Player Elements
 - Type of Event
- ⇒ Antagonistic Elements
 - Type Event
- ⇒ Global Elements
 - Type of Event
- ⇒ Splash Screens

- Type of Event
- ⇒ Menus
 - Type of Event
 - Type of Options

Code Structure

This is where an overview of how objects/functions/data interact, a list of what specified functions/routines do and a list of what order modules will be written.

Concerns and Alternatives

If there are concerns about something technical, they should be stated here, along with any alternatives to the concern.

Resources

The resources section lists applications and equipment that are acceptable for use in the development of this game. This begins to satisfy a legal challenge that developers must begin to be aware of.

Technical Matrix

The technical matrix section will be split into the different device series for each content category. The technical matrix includes the content lists of Audio, Visual, and Programming.

REFERENCE DOCUMENTS / TEMPLATES

GAME MODIFICATION PLAN

Game Reviewed:

Game Platform:

1. Create a revised object of the game based on your ideas and recommendations to improve it.
 2. List 3 or more specific changes you would make to the game. Why and how will these changes improve the game?
 3. List 3 or more reasons why the original designers did not choose these changes and ideas you identified.
 4. List 3 or more reasons why these changes may be difficult to include if the game were revised.

5. Briefly explain why you would like to make these changes.

REFERENCE DOCUMENTS / TEMPLATES

GAME MODIFICATION TASK SHEET

Game Reviewed:

Game Platform:

1. Provide a detailed overview of the object of the game.
2. List 3 or more things you like about the game. Why?
3. List 3 or more things you do not like about the game. Why?

List 3 or more reasons why you think the game you are reviewing is successful.

REFERENCE DOCUMENTS / TEMPLATES

GAME PITCH PROPOSAL (TEMPLATE)

A *Game Pitch Proposal* should be brief (e.g. 9 pages maximum) and clear (e.g. 12 point font). The typical *Game Pitch Proposal* includes:

1. Cover page: Title of project and group members.
2. Executive summary (1/2 page max): Briefly describe the game in two paragraphs.
3. Game Description (7 page max): Describe the game in greater detail.
(Label and include the following 8 subsections listed below)
 - a. Overview: (1/2 page max) Big picture of the game, main quest, main players, etc.
 - b. The Quest: (1/2 page max) Describe the quest in further detail, obstacles, rewards, and the final objective. Is the game broken into levels or intermediate stages of gameplay?
 - c. Main Character: (1/2 page max) Describe main character, powers, change with gameplay, first-person, third-person?
 - d. Sketch of Main Character: (1 page max) A sketch of the Main Character.
 - e. Opponents: (1/2 page max) Describe main opponents, intelligence, attack, hide, or evade?
 - f. Sketch of Opponents: (1 page max) A sketch of the primary Opponents.
 - g. Environment: (1/2 page max) Description of the environment in which the game is played, outer space, urban, futuristic, etc.
 - h. Sketch of World: (1 page max) A sketch of the level in which the game is played.

- i. Menus: (1/2 page max) initial menu screen and any options include a sketch.
 - j. Controls: (1/2 page max) Describe interface (up, down, run, shoot, fast, slow).
 - k. Sounds: (1/2 page max) Describe background sounds: music, footsteps, Vehicle, Door, etc.

4. Summary (1/2 page max): This is the final sales pitch. Include a brief summary that would make someone want to buy your game!

REFERENCE DOCUMENTS / TEMPLATES

WORK BREAKDOWN STRUCTURE (WBS)

Project Name:

Name:

Level	WBS Code	Element Name (Development Steps)	Definition (Clearly define work to be done)

REFERENCE DOCUMENTS / TEMPLATES

PROJECT CHARTER

Project Charter

Project Name	
Project Description	
Project Sponsor	
Project Team Member(s)	
Project Objectives	
Project Milestones	
Assumptions	
Project Completion Date	

We agree that this is a viable project. The Project Team Member(s) are authorized to begin the planning, design, and development process for this project.

Project Sponsor	
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MISCELLANEOUS TECHNICAL WEB RESOURCES

Unity Game Engine / Game Editor Software

- Unity 3d (<http://unity3d.com/unity/download>)

Unity Learning Materials and References

- Self-Study Learning Materials <http://unity3d.com/learn>
- Unity Online Docs and Technical Manuals: <http://docs.unity3d.com/Manual/index.html>

Unity Game Assets and Program Extensions

- Unity Asset Store (<https://www.assetstore.unity3d.com/>) Access to a huge assortment of textures, sounds, models, shaders, program extensions and more! Most assets are offered as a site license for schools, so they're affordable. Also, search "free" for an amazing selection of free goodies.

(Supplemental) Art, Modeling, and Asset Creation Software Products

- Adobe Photoshop (<http://www.photoshop.com/>)
- Autodesk 3ds Max (<http://www.autodesk.com/education/free-software/3ds-max>)
- Autodesk Maya (<http://www.autodesk.com/products/autodesk-maya/overview>)
- Blender (<http://www.blender.org/>)
- Maxon Cinema 4D (<http://www.maxon.net>)
- Gimp (<http://www.gimp.org/>)
- Google SketchUp (<http://www.sketchup.com>)
- Side Effects Software Houdini (<http://www.sidefx.com>)

Textures Assets

- CG Textures (<http://www.cgtextures.com/>) The world's largest texture site, this site offers a plethora of high quality photo references to be used for texture generation. In addition this site also offers a small selection of useful tutorials.
- Texture King (<http://www.textureking.com>) Offers textures in concrete, grunge, wood, stone/rock, metals, fabric, paint, rust, plastic, dirt/sand, liquids, glass and plaster.
- 2 Textured (<http://www.2textured.com>) Good resource for weapon, food, animal, and vehicle textures and images among other things.
- Stock Textures (<http://stocktextures.com/>) Free and open archive for high-quality, tileable textures.

Audio Assets

- Flashkit (<http://www.flashkit.com/soundfx/>) List of shareware and freeware Sound FX in the following categories: ambience, communication, cartoon, creatures, domestic, electronic, industrial commercial, instruments, interfaces, mayhem, mechanical, nature, people, recreation, and transportation.
- Indie Game Music (<http://indiegamemusic.com/>) Offers free music for games. Even though you can use the music for free, some of the files do require you to email the creator and let them know you are going to use the file(s).
- Jamendo (<http://www.jamendo.com/>) Jamendo offers free streaming and download of music published under Creative Commons licenses. On Jamendo, artists grant use of their music for private uses free of cost.
- Free Sound Effects (<http://www.freesoundeffects.com/>) While many of the sounds on this site must be paid for, there is a good selection of free sound effect as well.

Model Assets

- TurboSquid (<http://www.turbosquid.com/Search/?KEYWORD=Free>) Offers models in a multitude of formats. There are models for purchase but also a great number of free models.
- Archive 3d (<http://www.archive3d.net>) A large variety of models in *.3DS and *.GSM formats.
- 3d Xtras (<http://www.3dxtras.com/index.asp>) This site offers an extensive number of models in the following formats: Max, 3ds, c4d, dwg, obj, mb.
- Artist-3d (<http://www.artist-3d.com/>) A free exchange directory of royalty free 3d models in these formats: 3ds, obj, pz3, pp2, max, mb.
- Exchange 3d (http://www.exchange3d.com/FreeModels/cat_35.html) While Exchange3d is primarily a commercial site, they do offer numerous pages of free, high quality models.

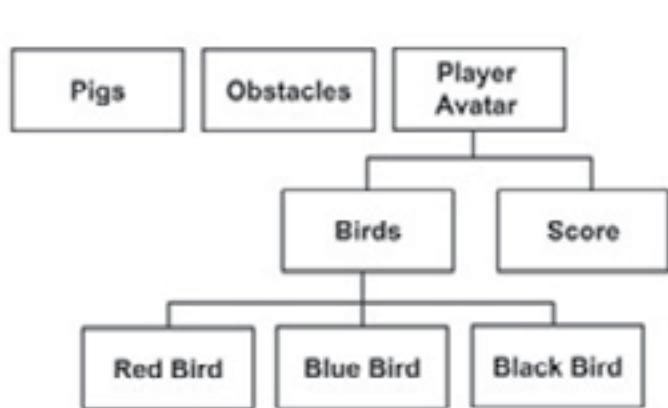
(Supplemental) Bug Tracking Software Products

- Bugzilla (<http://www.bugzilla.org/>) Bugzilla is a server-side bug tracking system that allows you to keep track of outstanding bugs in your product. You can track bugs and code changes, communicate with collaborators, submit and review patches, and manage quality assurance.
- Landfill (<http://landfill.bugzilla.org/>) Landfill is the home of test installations for Bugzilla. These are demo installations that you can use to "try out" Bugzilla.

SAMPLE DIAGRAMS AND MATRICES

INTERACTION MATRICES

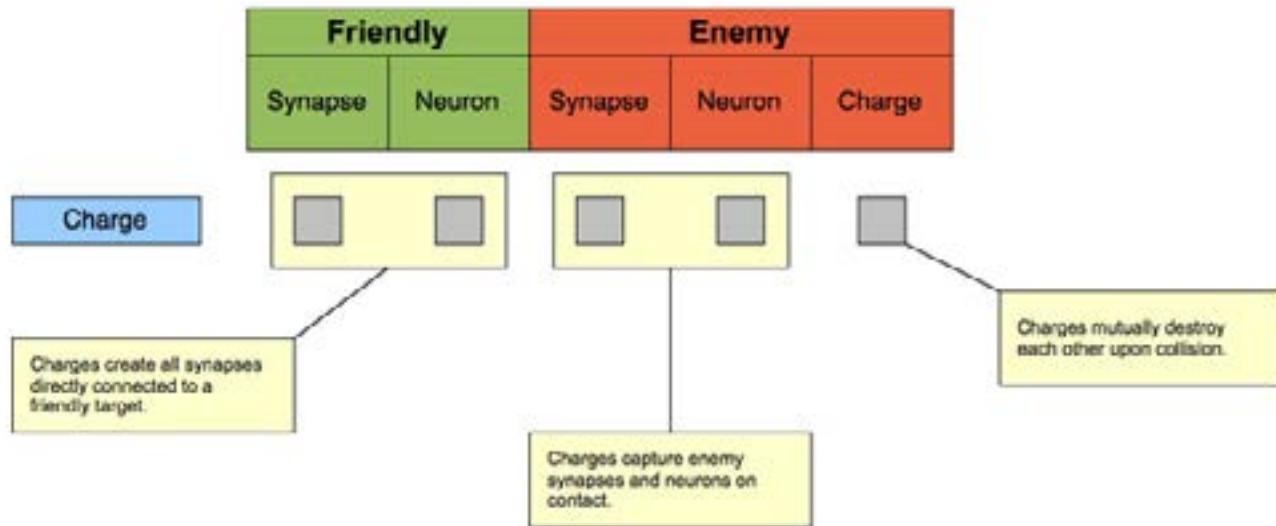
Example 1: Angry Birds



BIRDS		PIGS		OBSTACLES		SCORE	
BIRDS	PIGS	OBSTACLES	SCORE	BIRDS	PIGS	OBSTACLES	SCORE
X					X		
	COLLISION EVENT (Destroy Pigs)				X		
		COLLISION EVENT (Destroy Obstacles)				X	
			COLLISION EVENT (Destroy Pigs)				
				X			
					SCORE EVENT (Add XXX Points)		SCORE EVENT (Add YYY Points)
						X	X

Example 2: Cortex

Public Playtest 1
This is the interaction matrix from Public Playtest 1, before the addition of any charge types.

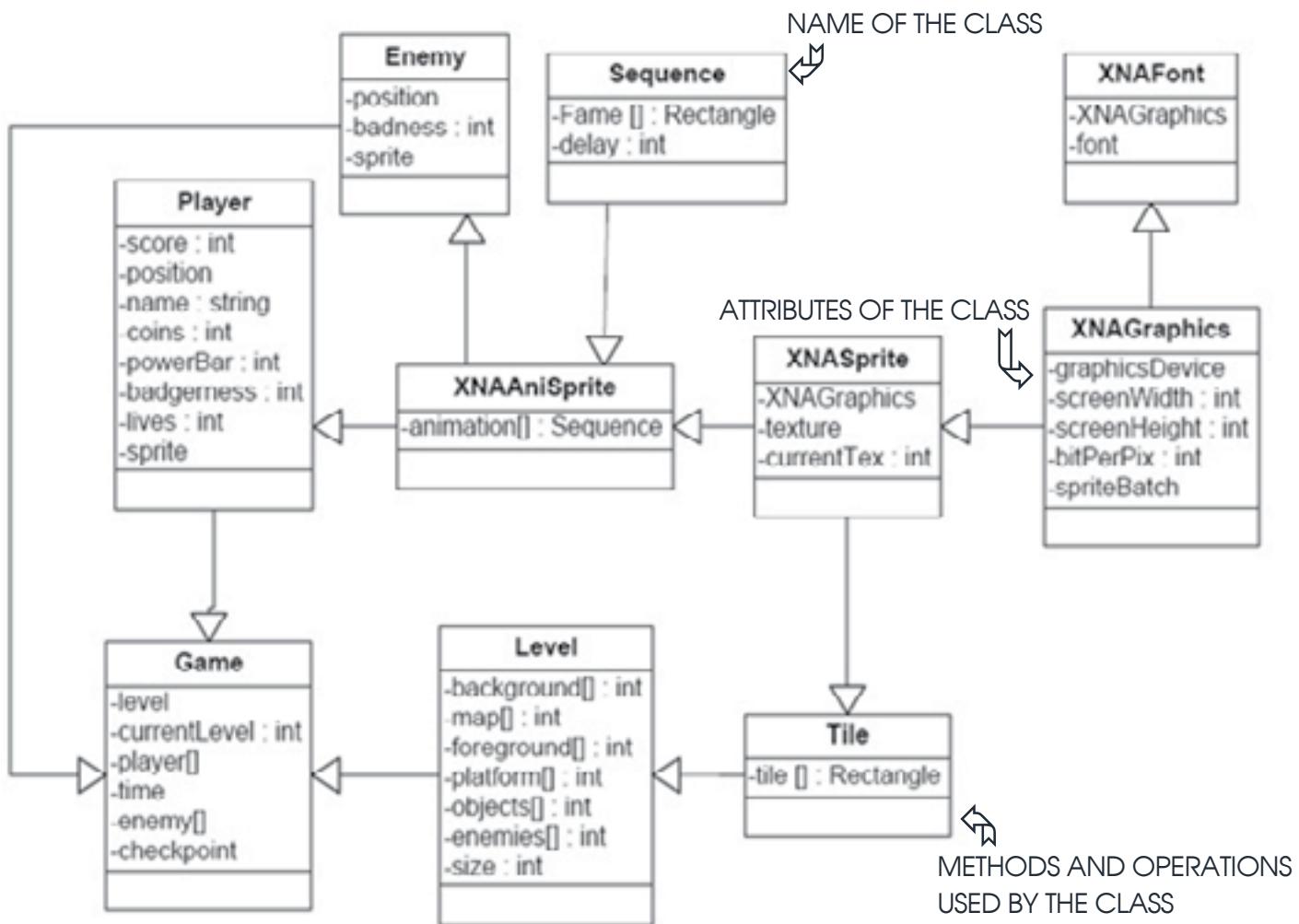


SAMPLE DIAGRAMS AND MATRICES

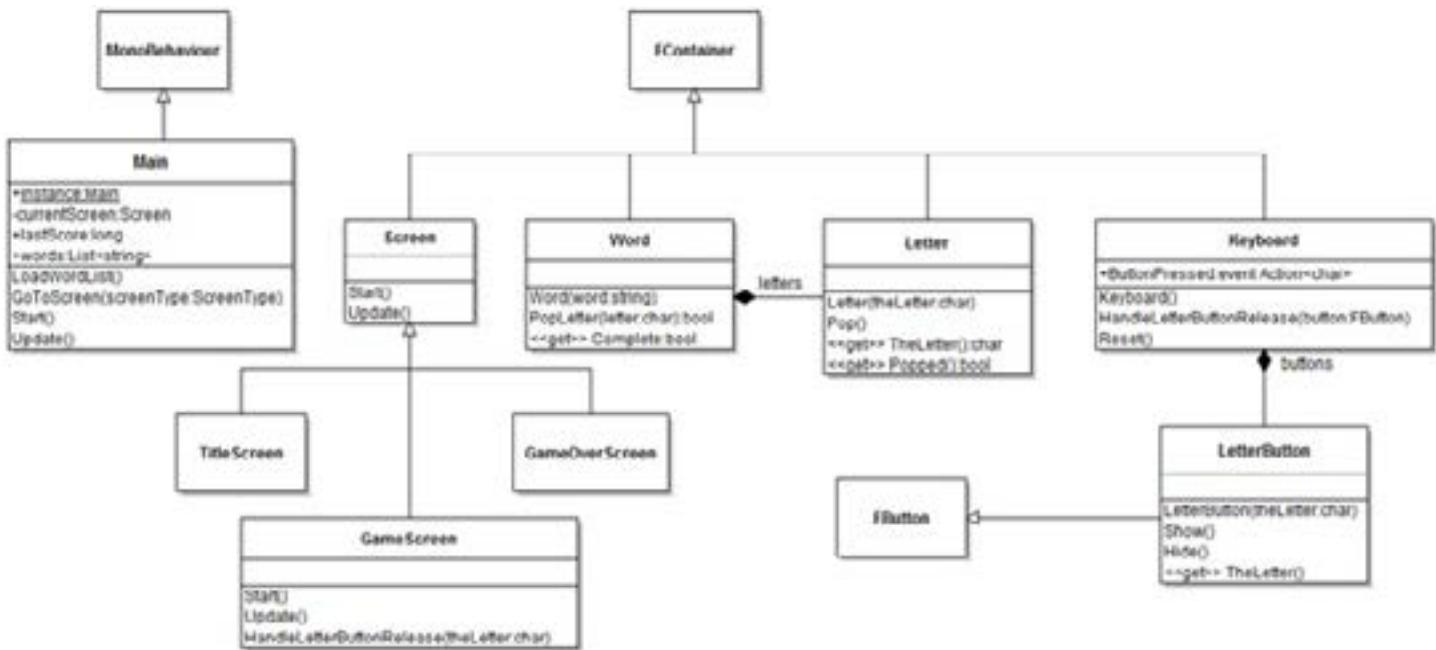
CLASS DIAGRAMS

A class diagram is a breakdown of all interactive objects within your game. Within each box, there are three (i.e. smaller box) sections. The top section provides the name of the class. The middle section should contain all the attributes of the class. The bottom section will contain methods and operations which are used by the class.

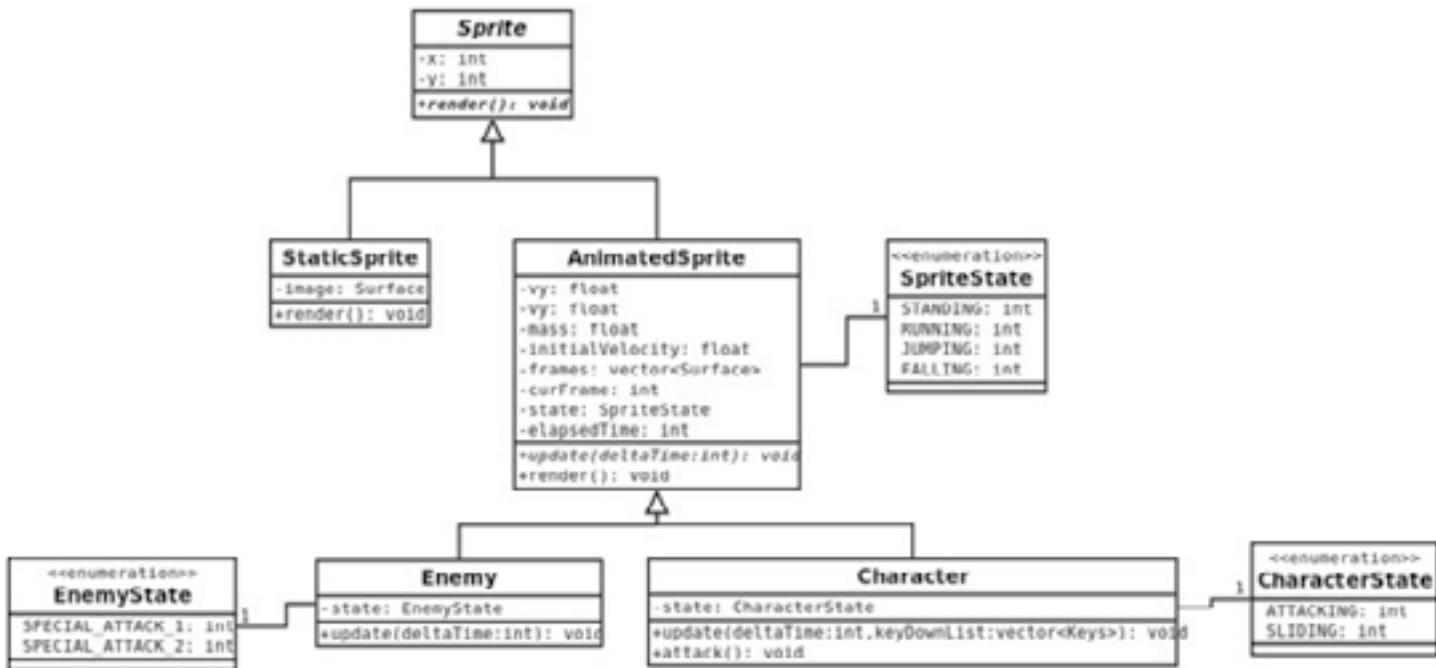
Example 1:



Example 2:



Example 3:



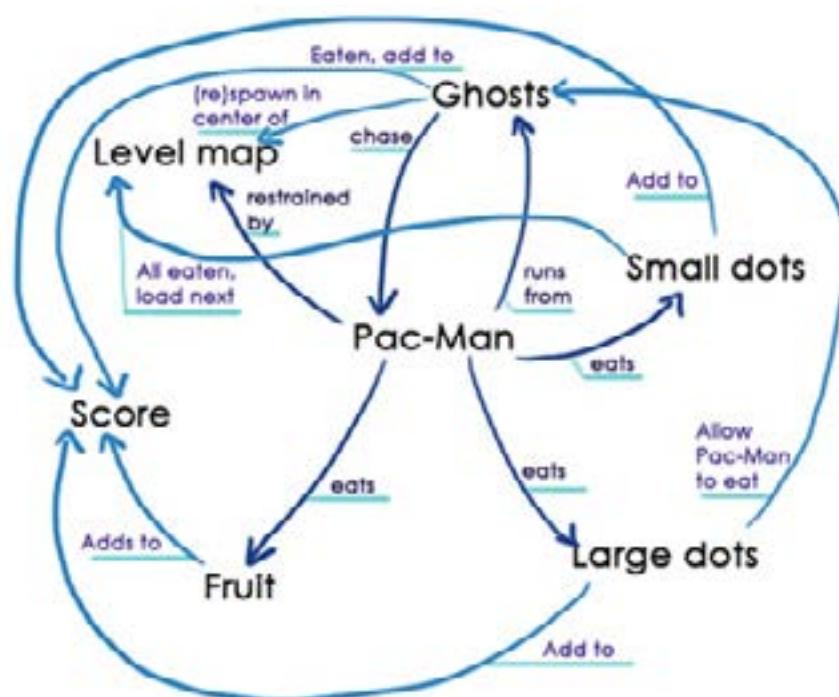
SAMPLE DIAGRAMS AND MATRICES

GAME FLOW DIAGRAMS

Example 1: Pac-Man



Example 2: Ms. Pac-Man



MISCELLANEOUS GAME INDUSTRY INFORMATION

Below you will find examples of game Taxonomy, Genres, Elements, Content, Themes, and Styles. While this section offers a thorough coverage, it is not exhaustive.

Taxonomy

- ⇒ Simulation
 - Story
 - Play
 - Chance
 - Fiction
 - Non Fiction
- ⇒ Story
 - Simulation
 - Play
 - Chance
 - Fiction
 - Non Fiction
- ⇒ Play
 - Story
 - Chance
 - Simulation
 - Fiction
 - Non Fiction
- Role-play
- Simulator
- Strategy
- ⇒ More Specific
 - Abstract (i.e., Arkanoid)
 - Adventure
 - Arcade (very generalised category)
 - Beat-em-up
 - Flight Sim/Space Sim
 - FPS (first-person shooter)
 - MMOG (Massive Multi-player Online)
 - MMORPG (role playing game)
 - MMORTS (real time strategy)
 - MMOTBS (turn base strategy)
 - Platform
 - Puzzle
 - Racing
 - RPG (role-playing game)
 - RTS (real-time strategy)
 - Shoot-em-up (scrolling shooter)
 - TBS (turn based strategy)
 - Trading

Genres

- ⇒ Basic
 - Adventure
 - Arcade (any "twitch" element)
 - Construction & Management
 - Puzzle

Elements

- ⇒ Alignment
- ⇒ Catch
- ⇒ Chase
- ⇒ Collecting
- ⇒ Combat
- ⇒ Cooperation
- ⇒ Dodging
- ⇒ Escape
- ⇒ Fighting
- ⇒ Forbidden Act
- ⇒ Hiding
- ⇒ Jump
- ⇒ Luck
- ⇒ Maze
- ⇒ Nursing
- ⇒ Obstacles
- ⇒ Puzzle
- ⇒ React
- ⇒ Resource Management
- ⇒ Seeking
- ⇒ Shooting
- ⇒ Story Comprehension
- ⇒ Target
- ⇒ Trading
- ⇒ Trivia
- ⇒ Timing

Themes

- ⇒ Abstract
- ⇒ Crime
- ⇒ Fantasy
- ⇒ Noir
- ⇒ Porn
- ⇒ Sci-Fi
- ⇒ Spy
- ⇒ War
- ⇒ Western

Styles

- ⇒ Abstract
- ⇒ Cartoon
- ⇒ Manga
- ⇒ Old School
- ⇒ Realism

Content

- ⇒ Action
- ⇒ Drama
- ⇒ Erotic
- ⇒ Horror
- ⇒ Humor
- ⇒ Pure Play
- ⇒ Realism
- ⇒ Thriller

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