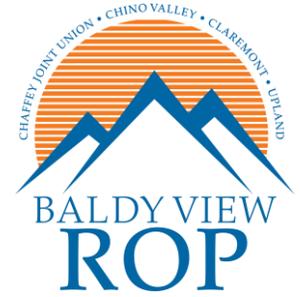# COMPUTER PROGRAMMING AND GAME DESIGN

INDUSTRY SECTOR | Information and Communication Technologies
PATHWAY | Games and Simulation

COURSE ESSENTIAL QUESTION:

Do you have what it takes to program a game?

COURSE OVERVIEW:

This course introduces students to the analysis, design, and creation of games. Students will learn how to break down a game and view it from a designer's perspective, as well as learn how to collaborate in a group when creating a game. This course also focuses on introduction to computer programming. Students will learn the fundamentals of programming and problem solving with an emphasis on game programming using an industry-standard language. Students will also be able to put their computer programming knowledge towards business, science, and mathematics.

INFORMATION:

A. **Pre-requisite**: None
B. **Abilities Required:** Math: Pre-Algebra or higher. Basic reading comprehension and writing skills.
C. **Dress Requirement and Grooming**: Casual
D. **Students must master** 70**% of the certificate competencies to receive a certificate.**
E. **Fee:** None
F. **Course Length:** 180 hours
G. **Textbook**: None

H. **UC a-g Approved:** No
I. **Industry Certification:** No

J. **Sequencing to Include a Capstone:** Yes
K. **Community College Articulation:** No

L. **Common Core Alignment:** Yes
M. **Community Classroom:** No
N. **Career Technical Student Organization:** No
O. **Work- Based Learning:** No

THEME: UNIT 1. Programming with Scratch

ENGAGING TITLE:

ESSENTIAL QUESTION: I can play it, but how do I make it?

**INSTRUCTIONAL HOURS: 90**

Common Core Unit Objective

Introduce overall programming structure through Scratch game engine. Discuss the fundamentals of programming and how they're applied in the real world. Students will discuss logical thinking and look at different methods to solve a problem, then find what methods are the most efficient.

Key Assignments

Students will develop several prototypes of a functioning game individually and in varying group sizes based upon a pre-existing game (e.g., Guitar Hero, Angry Birds).

Anchor Standards

2.0 **Communications**: Acquire and accurately use Information and Communication Technologies sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

    2.7   Use technical writing and communication skills to work effectively with diverse groups of people.

4.0 **Technology**: Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the Information and Communication Technologies sector workplace environment.

    4.1   Use electronic reference materials to gather information and produce products and services.

5.0 **Problem solving and Critical Thinking:** Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Information and Communication Technologies sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

    5.1   Identify and ask significant questions that clarify various points of view to solve problems.

    5.5   Use a logical and structured approach to isolate and identify the source of problems and to resolve problems.

    5.7   Work out problems iteratively and recursively.

   5.8   Create and use algorithms and solve problems.
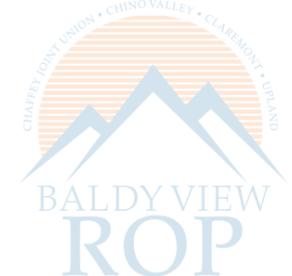
Pathway Standards

D2.0   Demonstrate an understanding of game and simulation analysis, design, standard documentation, and development tools.

   D2.1   Demonstrate an understanding of the vocabulary for discussing games and play by listing and describing the general procedure and requirements of game and simulation design.

   D2.5   Know how to use tools and software commonly used in game/simulation development and become familiar with popular game tools and different gaming engines.

D3.0   Create a working game or simulation individually or as part of a team.

   D3.3   Using simple game development tools, create a game or simulation.

D8.0   Acquire and apply appropriate artificial intelligence (AI) techniques used by the game development industry.

   D8.1   Describe AI and how it relates to game and simulation design and development.

   D8.3   Use AI techniques, like finite state machines, to produce the illusion of intelligence in the behavior of nonplayer characters (NPCs).

Common Core Standards

WS 11-12.9   Draw evidence from literary or informational texts to support analysis, reflection and research.

Geometry Congruence 12: Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
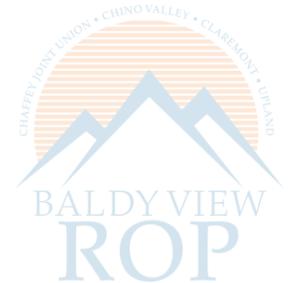
RESOURCES

Resources

1. Scratch.mit.edu
2. Dell Computer
3. Google Images
4. YouTube
5. Geometry Dash
6. Pixir.com
7. Guitar Hero
8. Angry Birds
9. Pong by Atari
10. World's Hardest Game
11. Bloons Tower Defense by Ninjakiwi.com
12. Black Jack (21)
13. Super Mario Bros. by Nintendo
14. Frogger by Sega
15. Flappy Bird
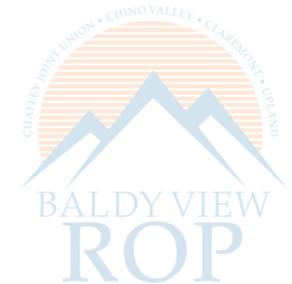
THEME: UNIT 2. Introducing C++ Programming

ENGAGING TITLE:

ESSENTIAL QUESTION: You didn't think it was that easy, did you?

INSTRUCTIONAL HOURS: 20

Common Core Unit Objective

Learn about the history and evolution of video games from just before they started to modern era. Discuss specific events that were significant to video games today such as the Video Game Crash of 1983, the uprising of Nintendo, and the entry of companies like Sony and Microsoft into the industry.

Key Assignments

- Present a gaming console and its historical significance; list significant or controversial games in console.
- Partner Project
- Demonstration to class using PowerPoint or Google Slides

Anchor Standards

2.0 **Communications**: Acquire and accurately use information and Communication Technology sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.
2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
4.0 **Technology**: Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the information and Communication Technologies sector workplace environment.
4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
4.5 Research past, present, and projected technological advances as they impact a particular pathway.

Pathway Standards

D1.0 Identify and describe critical game and simulation studies, the resulting societal impact, and the management, industry, and career requirements.
D1.1 Categorize the different gaming genres and gaming systems.
D1.2 Describe the historical significance of electronic and non-electronic games.
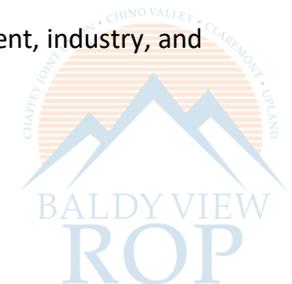
Common Core Standards

WS 11-12.9   Draw evidence from literary or informational texts to support analysis, reflection and research.

RESOURCES

Resources

1. Google
2. Microsoft PowerPoint/Google Slides
3. "Atari: Game Over" – Movie Documentary
4. YouTube
5. The Ultimate History of Video Games by Steven L. Kent, Chapter 1,2,3,4,5,6,7,8,9
6. Companies: Atari, Nintendo, Sony, IBM, Microsoft, Syzygy
7. John Coverdale – History of Video Games professor at Norco College
8. Games: Pong, E.T., Space Invaders, Monopoly, Spacewar!, Donkey Kong, Super Mario Bros., Pinball, Night Trap, Mortal Kombat,
9. Gamzi Pioneers – goo.gl/sjT.Ug
10. "All Your Base Are Belong To Us" by Harold Goldberg, Chapter 1, 2,3,4,5,6,7,8
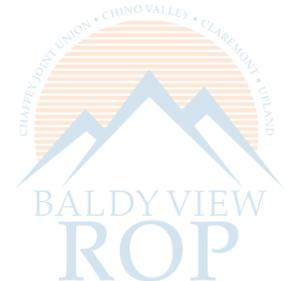
THEME: UNIT 3. A Designer's Perspective

ENGAGING TITLE:

ESSENTIAL QUESTION: But what makes it fun?

INSTRUCTIONAL HOURS: 20
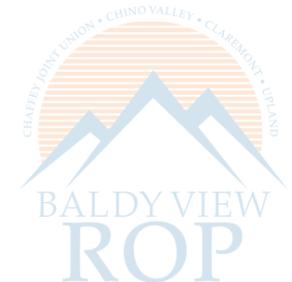
Common Core Unit Objective

Thoroughly analyze a game's design. Students will learn more terminology within game design and how to apply these terms to a thorough analysis of a game. Defining what Game Design is and how it connects to the pillars in game development.

Key Assignments

- Game Design Analysis – Students will each choose a game to analyze thoroughly and write a report of their analysis. Students will use proper game design terminology to explain their analysis in-depth.

Anchor Standards

2.0 **Communications:** Acquire and accurately use Information and Communication Technologies sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.
 2.5 Communicate information and ideas effectively to multiple audiences using a variety of media and formats.

4.0 **Technology:** Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the Information and Communication Technologies sector workplace environment.
 4.3 Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources.
 4.5 Research past, present, and projected technological advances as they impact a particular pathway.

Pathway Standards

D1.0   Identify and describe critical game and simulation studies, the resulting societal impact, and the management, industry, and career requirements.
- D1.1   Categorize the different gaming genres and gaming systems.
- D1.3   Describe the role of play in human culture.

D2.0   Demonstrate an understanding of game and simulation analysis, design, standard documentation, and development tools.
- D2.1   Demonstrate an understanding of the vocabulary for discussing games and play by listing and describing the general procedure and requirements of game and simulation design.
- D2.2   Describe the game development life cycle.
- D2.6   Demonstrate an understanding of the techniques used to evaluate game mechanics, game play, flow, and game design.
- D2.7   Describe the complex interaction between games and players and the role it plays in the popularity of a game.
- D2.8   Experience the methods used to create and sustain player immersion.

Common Core Standards

WS 11-12.6   Use technology, including the Internet, to produce, publish, individual or shared writing products in response to ongoing feedback, including new arguments or information.

WS 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.

RESOURCES

Resources

1. PowerPoints – Game Design by Judy Perry
    "I have no Words, I must Design: Toward a Critical Vocabulary for Games" – Greg Costikyan
2. Videos of gameplay
3. Articles
4. Challenges for Game Designers – Ian Schreiber, Chapters 1-2; Chapters 6-8
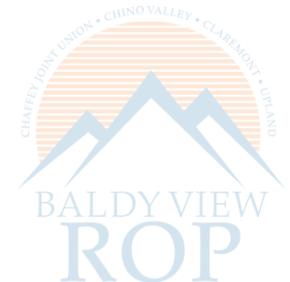
THEME: UNIT 4. It's time to collagorate!

ENGAGING TITLE:

ESSENTIAL QUESTION: Do you have the next best-selling game idea?

INSTRUCTIONAL HOURS: 20

Common Core Unit Objective

Students will learn about group dynamics and how to come to a consensus through proper communication. They will also learn how to properly document a game concept, and how to properly mention key elements when doing an elevator pitch.

Key Assignments

- Original game pitch and Concept document – Students will partner up and create an original game concept and pitch it to the class, as well as create an industry standard document for their concept.

Anchor Standards

Enter Anchor Standards

Pathway Standards

D2.0   Demonstrate an understanding of game and simulation analysis, design, standard documentation, and development tools.
   D2.3   Develop a game design document or blueprint.
D3.0   Create a working game or simulation individually or as part of a team.
   D3.1   Create a storyboard describing the essential elements, plot, flow, and functions of the game/simulation.
   D3.2   Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.
D4.0   Identify, describe, and implement standard game/simulation strategy and rules of play.
   D4.6   Assess common principles and procedures in game flow design.

Common Core Standards

WS 11-12.3   Write narratives to develop real or imaged experiences or events using effective technique, well-chosen details, and well-structured event sequences.
WS 11-12.4.   Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
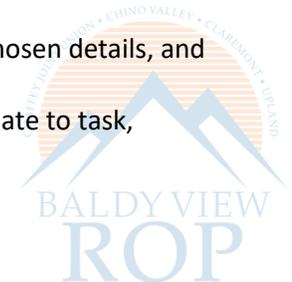
RESOURCES

Resources

1. PowerPoint
2. Word Documents
3. The Fundamentals of Small Group Communication by Carolyn M. Anderson & Scott A. Myers
4. High Concept Template by Ernest W. Adams
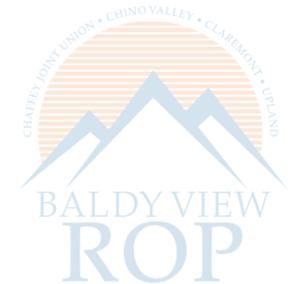
THEME: UNIT 5. The Development Process

ENGAGING TITLE:

ESSENTIAL QUESTION: Ready to show off what you've learned?

**INSTRUCTIONAL HOURS: 30**

Common Core Unit Objective

It's time to put the whole course's material to use. Students will learn about the development process by experiencing it themselves. Students will group together and create an original game concept, and build off of it. Students will present weekly milestone presentations on what their expected goals were, and if they achieved them for that week. They will also experience taking roles within a group setting in terms of game development, meaning they each have individual portions / tasks of the game they are responsible for.

Key Assignments

- Final Project – Students will partner/group up and create an original game using Scratch. They will apply their game concept to the appropriate document and each week will present weekly milestones.

Anchor Standards
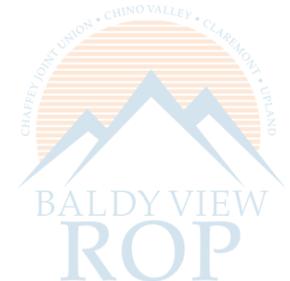
Enter Anchor Standards

Pathway Standards

D1.0   Identify and describe critical game and simulation studies, the resulting societal impact, and the management, industry, and career requirements.

      D1.7   Identify the core tasks and challenges that face a game or simulation design team.

D2.0   Demonstrate an understanding of game and simulation analysis, design, standard documentation, and development tools.

D3.0   Create a working game or simulation individually or as part of a team.

      D3.2   Create a design specification document to include interface and delivery choices, rules of play, navigation functionality, scoring, media choices, start and end of play, special features, and development team credits.

      D3.3   Using simple game development tools, create a game or simulation.

      D3.4   Present the game or simulation.

D7.0   Acquire and apply appropriate programming skills for rendering a single player or multiuser game or simulation project, including program control, conditional branching, memory management, scorekeeping, timed event strategies, and implementation issues.

      D7.2   Plan program design and evaluate assigned game programming tasks.

      D7.3   Code and test programs.

Common Core Standards

Enter Common Core Standards

RESOURCES

Resources

1. PowerPoint by Judy Perry – "Iteration and Rapid Proto Typing"; "Solo & Designer Testing"; "Non-Designer and Blind Testing"; "Game Balancing"; "Polishing"