

# Simulation and Animation Design

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The Research and Curriculum Unit (RCU), located in Starkville, MS, as part of Mississippi State University, was established to foster educational enhancements and innovations. In keeping with the land grant mission of Mississippi State University, the RCU is dedicated to improving the quality of life for Mississippians. The RCU

enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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# Standards

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Standards in the *Simulation and Animation Design Curriculum Framework and Supporting Materials* are based on the following:

## **National Educational Technology Standards for Students**

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## **ACT College Readiness Standards**



The College Readiness Standards are sets of statements intended to help students understand what is expected of them in preparation for the ACT. These standards are integrated into teaching and assessment strategies throughout the curriculum framework.

## **National Standards – International Game Developers Association (IGDA) Curriculum Framework**

The national standards within this curriculum come from the IGDA Curriculum Framework. These standards were reprinted with permission and can be located at <http://www.igda.org/wiki/images/e/ee/Igda2008cf.pdf>.

## Preface

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Secondary vocational–technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act IV, 2007; and No Child Left Behind Act of 2001).

# Simulation and Animation Design Research Synopsis

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Graphic and media designers plan, analyze, and create visual solutions to communications problems. They find the most effective way to get messages across in print, electronic, and film media using a variety of methods such as color, type, illustration, photography, animation, and various print and layout techniques. Graphic designers develop the overall layout and production design of Web pages, magazines, newspapers, journals, corporate reports, videos, and other publications. They also produce promotional displays, packaging, and marketing brochures for products and services, design distinctive logos for products and businesses, and develop signs for business and government.

## Employment Outlook

Based on the employment projections from the Department of Labor, the need for these types of jobs will continue.

Occupational Title	Employment	Projected	Change 2006–2016	
	2006	Employment 2016	Number	Percent
Art and Design Workers	4,730	5,350	620	13.1%
Computer Specialists	9,620	12,630	3,010	31.3%
Media and Communication Workers	5,510	6,260	750	13.6%

Based on the salary data from the Department of Labor, these positions in the Game Design and Development technology industry provide an annual mean wage of \$47,092.

The Entertainment Software Association (ESA), the association committed to serving the business and public affair needs of organizations that publish computer and video games, points out that between 2002 and 2006, direct employment for the industry grew at an annual rate of 4.4%. Currently, computer and video game companies directly and indirectly employ more than 80,000 people in 31 states. The ESA further highlights that in 2006, the entertainment software industry's value added to U.S. Gross Domestic Product (GDP) was \$3.8 billion. Such growth serves to highlight the potential for increased employment in this field.

## Industry Certification

Research with Mississippi industry suggests that this curriculum should be written to the Autodesk Certified Associate Certification. This exam assesses the foundation of animation skills students need to create effective animation using game design tools. This certification was developed after a group of industries met with educators to design the entry-level-skill industry standards for game design, development, and animation. Additionally, 3ds Max is the recognized industry software for animation production. It is recommended that this curriculum meets the Autodesk Certified Associate Certification.

## Industry Data

The Entertainment Software Association states that two thirds of all American households play video games. Video game software sales, according to the ESA, grew almost 28% in 2008, which more than quadrupled industry software sales since 1996. The fast growing trend in the industry is further validated by a report produced by PriceWaterhouseCoopers, which estimates that the video game market will increase from \$31.6 billion in 2006 to \$48.9 billion in 2011 making video games the third-fastest-growing segment of the entertainment and media market after TV distribution and Internet advertising and access spending. Interestingly, such growth in the industry is not limited to just young men and women. According to the ESA, the demographic set for video game usage is quite broad:



- The average game player is 35 years old and has been playing games for 12 years.
- The average age of the most frequent game purchaser is 39 years old.
- Forty percent of all game players are female. In fact, females over the age of 18 represent a significantly greater portion of the game-playing population (34%) than males age 17 or younger (18%).
- In 2009, 25% of Americans over the age of 50 played video games, an increase from 9% in 1999.
- Thirty-seven percent of heads of households play games on a wireless device, such as a cell phone or PDA, up from 20% in 2002.
- Ninety-two percent of game players under the age of 18 report that their parents are present when they purchase or rent games.
- Sixty-three percent of parents believe games are a positive part of their children's lives.

Interviews were conducted to gather information related to the graphics, print, and video industry. Trends show that employers use the Adobe suite for graphics and Web production. Trends also show that employers use the Final Cut Pro software for video production. The Final Cut Pro certification is not required but desired by employers. Overwhelmingly, the industry uses Macintosh computers. A trend in the research shows that industry would rather have students accustomed to Macintosh computers prior to entry into the postsecondary education and workforce arenas.

## Case Studies

The following curricula derive from postsecondary institutions and may not reflect the breadth and depth of curricula at the secondary level. However, a base knowledge of existing curricula is necessary to better understand the scope of classes offered at the postsecondary level as well as opportunities for articulation.

*Note: Program descriptions below were obtained from the individual program Web pages.*

### Austin Community College, Video Game Development

The Austin Community College Video Game Development program is designed and developed by leaders in the Austin video game development industry. Courses are taught by industry video game developers for those who want to become video game developers. The program offers a comprehensive approach toward learning what is needed to be successful in video game development. The curriculum provides for three areas of specialization: programming, art, and design.

Core Program Courses Offered	
<ul style="list-style-type: none"> <li>• Game and Simulation Programming I and II</li> <li>• Tools Programming</li> <li>• Advanced Game Programming</li> <li>• Console Programming</li> <li>• Multiplayer Programming I and II</li> <li>• Mobile Programming</li> <li>• Audio Programming</li> <li>• AI/Pathfinding</li> <li>• Mathematical Applications for Game Development</li> <li>• Engines</li> <li>• Design and Creation of Games I, II, and III</li> <li>• Level Design I and II</li> <li>• Interactive Writing I and II</li> <li>• Audio</li> <li>• Capstone – Video Games</li> </ul>	<ul style="list-style-type: none"> <li>• Game Scripting I and II</li> <li>• Video Game Art I and II</li> <li>• 3-D Modeling and Rendering I and II</li> <li>• Concept Art I - Conceptualizing Game Art Concept Art II - Game UI and Mapping</li> <li>• Concept Art III - Game Art Direction 3-D Animation I, II, and III</li> <li>• Introduction to Game Design and Development</li> <li>• Business of Video Games</li> <li>• Video Game Development</li> <li>• Video Game Production</li> <li>• Asset Management</li> <li>• Interactive</li> <li>• Shaders</li> </ul>

<http://www.austincc.edu/techcert/gaming/>

Arapahoe Community College, Game Design and Development

The Arapahoe Community College Game Design and Development program prepares students for a broad range of careers in the gaming industry, as an independent game developer, computer programming, or multimedia graphics. Students will develop 2-D and 3-D digital modeling, digital animation, and programming skills using an industry standard gaming engine. Course electives allow students to gain experience with digital sound editing, 2-D game development, and additional 3-D modeling.

Core Program Courses Offered	
<ul style="list-style-type: none"> <li>• Adobe Photoshop I</li> <li>• Introduction to Programming</li> <li>• Game Design and Development</li> <li>• Introduction to Computer Applications</li> <li>• Introduction to MS Visual Basic</li> <li>• Computer Science I and II: (JAVA)</li> <li>• Adobe Illustrator I</li> </ul>	<ul style="list-style-type: none"> <li>• Game Programming I</li> <li>• Digital Animatics</li> <li>• 3-D Animation I</li> <li>• Sound Design I</li> <li>• 3-D Game Programming</li> <li>• Game Scripting 3</li> <li>• Cooperative Education</li> </ul>

<http://www.arapahoe.edu/deptprgrms/degreqs/aas-game-design.html>

Camden County College, Game Design and Development

The Camden County College Game Design and Development program is designed for students interested in creating anything game related—from 3-D objects to environments to entire games themselves. Students will use a variety of design software and learn specific programming techniques involved in creating interactive games.

<b>Core Program Courses Offered</b>	
<ul style="list-style-type: none"><li>• Computer Graphic Design I and II</li><li>• Fundamentals of Programming</li><li>• Digital Storytelling</li><li>• Game Design and Development I, II, and III</li><li>• Computer Animation I and II</li></ul>	<ul style="list-style-type: none"><li>• Digital Illustration</li><li>• Multimedia Technology I and II</li><li>• Structured Programming (C++)</li><li>• Special Effects</li><li>• Video Imaging Technology I</li></ul>

[http://www.camdencc.edu/college\\_pubs/catalog09/CCC%20Catalog%2008-09.pdf](http://www.camdencc.edu/college_pubs/catalog09/CCC%20Catalog%2008-09.pdf)

ITT Tech, Digital Entertainment and Game Design

The ITT Tech Digital Entertainment and Game Design program is designed to help graduates prepare for career opportunities in a variety of entry-level positions involving technology associated with designing and developing digital games and multimedia applications. Courses in this program offer a foundation in digital game design.

<b>Core Program Courses Offered</b>	
<ul style="list-style-type: none"><li>• Introduction to Gaming Technology Managing Game Development</li><li>• Physics of Animation</li><li>• Game Design Process</li><li>• Creative Writing and Storyboarding for Games</li><li>• Game Design Strategies</li></ul>	<ul style="list-style-type: none"><li>• Advanced Animation</li><li>• Level Design I and II</li><li>• Game Interface Design</li><li>• Game Engines and Production</li><li>• The Game Development Team</li><li>• Capstone Project</li></ul>

<http://itt-tech.edu/campus/courses.cfm>

Devry University, Game and Simulation Programming Program

The Devry University Game and Simulation Programming program is designed to prepare graduates to join the private and public sector game software industry in a variety of software development roles across the game programming life cycle, including programmer, software engineer, and project coordinator. Applications-oriented, the program provides preparation in the math and physics of games; programming fundamentals; game design; modifications (MOD) and massively multiplayer online game (MMOG) programming; two- and three-dimensional graphics programming; and simulation and game engine design.

<b>Core Program Courses Offered</b>	
<ul style="list-style-type: none"> <li>• Introduction to Game and Simulation Development</li> <li>• System Architecture and Assembler with Lab</li> <li>• Math for Game Programming I and II</li> <li>• Practical Game Design with Lab</li> <li>• Visual and Audio Design Fundamentals with Lab</li> <li>• Simulation Design with Lab</li> <li>• Data Structures and Artificial Intelligence with Lab</li> </ul>	<ul style="list-style-type: none"> <li>• Modification and Level Design with Lab</li> <li>• Applied Development Project</li> <li>• Multimedia Programming with Lab</li> <li>• Software Engineering for Game Programming with Lab</li> <li>• Game Engine Design and Integration with Lab</li> <li>• Programming for MMOG with Lab</li> </ul>

<http://www.devry.edu/degree-programs/college-engineering-information-sciences/game-and-simulation-programming-about.jsp>

# Simulation and Animation Design

## Executive Summary

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### Program Description

Simulation and Animation Design is a pathway in the Science, Technology, Engineering, and Mathematics (STEM) career cluster. This program is designed for students who wish to develop, design, and implement projects in the ever-expanding field of game design and development. The program emphasizes the techniques and tools used in game design and the creative design or content of such media. Both theoretical learning and activity-based learning are provided for students who wish to develop and enhance their competencies and skills. The program focuses on the basic areas of ethics, character development, audio and video production, and design using visualization software. The program finishes with a performance-based unit that requires students to develop their own gaming environment. This comprehensive project component provides practical experience toward developing a portfolio of work. Membership is encouraged in the student organization, Technology Student Association (TSA), which promotes technological literacy, leadership, and problem solving, resulting in personal growth and opportunity.

### Industry Certification

Research with Mississippi industry suggests that this curriculum should be written to the Autodesk Certified Associate Certification. This exam assesses the foundation of animation skills students need to create effective animation using game design tools.

### Articulation

An articulation agreement is currently under development. As soon as the agreement is finalized, this document will be updated to reflect the agreement.

### Assessment

Students will be assessed using the Simulation and Animation Design test. The Mississippi Career Planning Assessment System, Second Edition (MS-CPAS2) blueprint can be found at <http://info.rcu.msstate.edu/services/curriculum.asp>. If there are questions regarding assessment of this program, please contact the STEM instructional design specialists at the Research and Curriculum Unit at 662.325.2510.

### Student Prerequisites

An eligible student must have completed the ninth grade and Algebra I and must have an overall B average. Prior to a student's being enrolled in the course, a behavior reference must be obtained from an academic technology teacher.

## Course Specification

The recommended class size is 20 students per class. The district will be responsible for providing and maintaining all equipment, providing proper security, replacing missing equipment, and providing annual funds for operation of the program.

## Proposed Applied Academic Credit

The academic credit is still pending for this curriculum.

## Licensure Requirements

The 988 license is needed to teach the Simulation and Animation Design program. The requirements for the 988 license endorsement are listed below:

1. Applicant must have a 4-year degree in a related field or one approved by the Mississippi Department of Education (MDE).
2. Applicant must enroll immediately in the Vocational Instructor Preparation (VIP) program or the College and Career Readiness Education Program (CCREP).
3. Applicant must complete the individualized Professional Development Plan (PDP) requirements of the VIP or CCREP prior to the expiration date of the 3-year vocational license.
4. Applicant must possess and maintain Autodesk Certified Instructor (ACI).
5. Applicant must successfully complete the MDE-approved Internet and Computing Core Certification (IC<sup>3</sup>).
6. Applicant must successfully complete certification for an online learning workshop, a module, or a course that is approved by the MDE.
7. Applicant must successfully complete a Simulation and Animation Design certification workshop, module, or course that is approved by the MDE.

**Note:** If an applicant meets all requirements listed above, that applicant will be issued a 988 endorsement—a 5-year license. If an applicant does not meet all requirements, the applicant will be issued a 3-year endorsement license, and all requirements stated above must be satisfied prior to the ending date of that license.

## Professional Learning

The professional learning itinerary for the middle school or individual pathways can be found at <http://redesign.rcu.msstate.edu>. If you have specific questions about the content of each training session provided, please contact the RCU at 662.325.2510, and ask for the Professional Learning Specialist.

## Course Outlines

This curriculum framework allows for local school districts to meet student needs and scheduling demands. The first option groups units into four 1-Carnegie-unit courses. The second option groups units into two 2-Carnegie-unit courses. A discussion of each option is listed below.

The first three courses of the Simulation and Animation Design program (Ethics, Design Theory, and Photography; Design Visualization and Character Development; and Audio and Video Production) introduce students to the principles and skills associated with game design and development technology as related to meeting the needs of clients and producing game design products. Business, Evaluation, and Development of Gaming concentrates on video game production, a directed group project, and portfolio finalization. These courses must be taken in sequential order.

### **Option 1**

By following this course of study for Simulation and Animation Design, the students will progress through a series of four one-credit courses that should be completed in the following sequence:

1. Ethics, Design Theory, and Photography (Course Code: 994402)
2. Design Visualization and Character Development (Course Code: 994403)
3. Audio and Video Production (Course Code: 994404)
4. Business, Evaluation, and Development of Simulation and Animation Projects (Course Code: 994405)

**Ethics, Design Theory, and Photography (Course Code: 994402):** This first course in the program identifies the foundation skills necessary in the game design industry. Content such as safety, ethical issues, video game history, career opportunities, game mechanics, and photography is offered to students.

**Design Visualization and Character Development (Course Code: 994403):** This course emphasizes real-world, hands-on practice. Content related to illustration, level design, character development, and animation is offered to students. This 1-Carnegie-unit course should only be taken after students successfully pass Ethics, Design Theory, and Photography (Course Code: 994402).

**Audio and Video Production (Course Code: 994404):** This course focuses on audio design, programming, and video production. This one-Carnegie-unit course should only be taken after students successfully pass Design Visualization and Character Development (Course Code: 994403).

**Business, Evaluation, and Development of Simulation and Animation Projects (Course Code: 994405):** This is the capstone course that gives students the opportunity to produce a final video game project that incorporates the skill and knowledge learned in the first three Simulation and Animation Design courses, giving the students the chance to showcase what they have learned and accomplished. Upon the completion of this course, the students will also have put the finishing touches on a video game portfolio that is cumulative of their work throughout all semesters of Simulation and Animation Design. This is a 1-Carnegie-unit course and should be taken after students successfully pass Ethics, Design Theory, and Photography (Course Code: 994402), Design Visualization and Character Development (Course Code: 994403), and Audio and Video Production (Course Code: 994404).

**Ethics, Design Theory, and Photography (One Carnegie Unit) - Course Code: 994402**

Unit	Title	Hours
1	Introduction, Safety, and Orientation	10
2	Ethics in the Game Design Industry	20
3	Games and Society	20
4	Game Design Theory and Mechanics	60
5	Photography for Game Design	30
		140

**Design Visualization and Character Development (One Carnegie Unit) - Course Code: 994403**

Unit	Title	Hours
6	Artistic Rendering Using Illustration Software	30
7	Design Visualization Software Introduction	10
8	Geometry in Design Visualization Software	20
9	World Design Using Design Visualization Software	30
10	Character Development and Animation	50
		140

**Audio and Video Production (One Carnegie Unit) - Course Code: 994404**

Unit	Title	Hours
11	Audio Design	40
12	Video Game Programming	60
13	Video Game Production	40
		140



**Business, Evaluation, and Development of Simulation and Animation Projects (One Carnegie Unit) - Course Code: 994405**

Unit	Title	Hours
14	Business of Gaming	40
15	Simulation and Animation Design Seminar and Experience	80
16	Game Evaluation	20
		140

**Option 2**

**Course Description: Simulation and Animation Design I – Course Code: 994400** encompasses the foundation skills necessary in the game design industry. Content such as safety, ethical issues, video game history, career opportunities, game mechanics, and photography with emphasis placed on real-world, hands-on practice related to illustration, level design, character development, and animation is offered to students. Students will receive two Carnegie units upon completion of the course.

**Course Description: Simulation and Animation Design II – Course Code: 994401** focuses on audio design, programming, and video game production. This course gives students the opportunity to produce a final video game project that incorporates the skills and knowledge learned in the Simulation and Animation Design I course, allowing the students the chance to showcase what they have learned and accomplished. Upon the completion of this course, the students will also have put the finishing touches on a video game portfolio that is cumulative of their work throughout all semesters of Simulation and Animation Design. Students will receive two Carnegie units upon completion of the course.

**Simulation and Animation Design I (Two Carnegie Units) - Course Code: 994400**

Unit	Title	Hours
1	Introduction, Safety, and Orientation	10
2	Ethics in the Game Design Industry	20
3	Games and Society	20
4	Game Design Theory and Mechanics	60
5	Photography for Game Design	30
6	Artistic Rendering Using Illustration Software	30
7	Design Visualization Software Introduction	10
8	Geometry in Design Visualization Software	20

9		World Design Using Design Visualization Software	30
10		Character Development and Animation	50
			280

**Simulation and Animation Design II (Two Carnegie Units) - Course Code: 994401**

Unit		Title	Hours
11		Audio Design	40
12		Video Game Programming	60
13		Video Game Production	40
14		Business of Gaming	40
15		Simulation and Animation Design Seminar and Experience	80
16		Game Evaluation	20
			280

# Ethics, Design Theory, and Photography

## Unit 1: Introduction, Safety, and Orientation

**Competency 1:** Identify course expectations, school policies, program policies, and safety procedures related to Simulation and Animation Design. (DOK1)

### Suggested Enduring Understandings

1. Policies, expectations, and safety procedures are essential elements for any endeavor.

### Suggested Essential Questions

1. What would it be like without rules, policies, and safety procedures?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify course expectations, school policies, and program policies related to game design technology (GDT).	<p>a. Prepare a multimedia presentation to preview the school's handbook, the technology acceptable use policy, and safety procedures for classrooms and building level. <small>CS6, CS8, CS9, CS10, CS11, T1, T2, T6</small></p> <p>Have students use a Venn diagram to compare and contrast course, school, and program policies to employee expectations. Have students summarize the comparison in a blog entry.</p>	<p>a. Conduct a Jeopardy game show to test students' knowledge of course expectations, school policies, learning styles, and program policies related to GDT.</p> <p>Use the Blog Rubric to evaluate student Venn diagram comparisons.</p>
b. Apply safety procedures in the computer classroom and lab.	<p>b. Discuss lab and equipment safety procedures to include fire extinguishers, clothing, electrical, and jewelry. Pre-assess student knowledge of workplace safety by asking students to describe potential computer-related health problems and workplace safety issues. <small>CS6, CS8, CS9, CS10, CS11, T1, T2, T6</small></p>	<p>b. Assess each student's safety knowledge with a unit test administered via the Blackboard Learning System, and file the completed test for documentation. Each student must score 100% accuracy before being allowed to participate in lab activities.</p>

**Competency 2:** Explore personality development, leadership, and teamwork in relation to the classroom environment, interpersonal skills, and others. (DOK1)

**Suggested Enduring Understandings**

1. Personality, teamwork, and leadership abilities are integral components for creating a healthy learning community.

**Suggested Essential Questions**

1. How can you create a harmonious work environment that includes a diverse group of different personality types and skill levels?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify potential influences that shape the personality development including personality traits, heredity, and environment.</p>	<p>a. Show students a learning style video found at <a href="http://www.teachertube.com">http://www.teachertube.com</a> (Title: <i>Just Say Yes!</i>) (Multiple Learning Styles). Have students take a learning styles inventory (<a href="http://www.vark-learn.com">http://www.vark-learn.com</a>) to determine student learning styles. Explain to students that it is important to know how they learn. Have students divide into groups based on learning styles. Have each group create a collage using magazines and bulletin board/poster paper that explains its learning style. <small>CS6, CS8, CS9, CS10, CS11, T1, T2, T6</small></p>	<p>a. Collage Rubric</p> <p>Use information from this inventory throughout the year when assigning group work. Have students summarize the information from the learning style and personality inventory in a blog entry titled "How I Learn Best."</p>
<p>b. Develop a report on how personality traits affect teamwork and leadership skills.</p>	<p>b. Discuss the importance of understanding different personalities. <small>CS6, CS8, CS9, CS10, CS11, CS14, T1, T2, T6</small></p>	<p>b. Analyze short scenarios of cooperative and uncooperative group members.</p>
<p>c. Identify forces that shape personality development including personality traits, heredity, and environment.</p>	<p>c. Discuss role-play learning styles to effectively work in a team setting. <small>CS6, CS8, CS9, CS10, CS11, CS14, T1, T2, T6</small></p>	<p>c. Use the Role-play or Skit Rubric to evaluate student work.</p>
<p>d. Develop effective leadership, decision making, and communication skills.</p>	<p>d. Discuss the qualities of an effective leader, and identify opportunities available through student organizations and in the local community that develop leadership skills. <small>CS6, CS8, CS9, CS10, CS11, CS16, T1, T2, T6</small></p> <p>Have students identify and interview five community leaders and ask each leader, "Why do you think you are an effective leader?" Have students bring those traits to the next class meeting. Students will write a short report that must include the results of the interviews as well as a goal each student will work toward in improving their own leadership.</p>	<p>d. Leader Rubric</p>

# Standards

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## **21st Century Learning Standards**

- CS6 Creativity and Innovation
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy
- CS14 Social and Cross-Cultural Skills
- CS16 Leadership and Responsibility

## **National Educational Technology Standards for Students**

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T6 Technology Operations and Concepts

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*What do employers expect from me?* [Poster]. (Available from Tech Prep Office, Mississippi Department of Education, P.O. Box 771, Jackson, MS 39205)

For additional references, activities, and Web resources, please refer to the Game Design Technology P.A.C.E. Web site at <http://rcu.blackboard.com> (available only to registered users).

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Computer Lab Safety Test

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Directions: In the space provided, write the word "True" if the statement is true and "False" if the statement is false.

1. \_\_\_\_\_ Never bang on the keys; always use a light touch on the keyboard to keep the keys operating properly.
2. \_\_\_\_\_ Save the document you are working on often.
3. \_\_\_\_\_ Remove diskettes when the disk drive light is on.
4. \_\_\_\_\_ Never attempt to work on a computer or go inside the computer while it is on; you could get shocked.
5. \_\_\_\_\_ When connecting cables to the computer, make sure the cables are plugged in the outlets before attaching them to the computer.
6. \_\_\_\_\_ All power cords should be secured from traffic areas.
7. \_\_\_\_\_ To make sure your computer operates properly, make sure you have appropriate temperature and humidity levels.
8. \_\_\_\_\_ Do not use the computer during a storm.
9. \_\_\_\_\_ Spray your computer with household cleanser to keep it clean.
10. \_\_\_\_\_ Canned air can be used to clean your computer keyboard.
11. \_\_\_\_\_ Opening an e-mail attachment could download a virus into your computer system.
12. \_\_\_\_\_ Spilling liquids on your computer will not hurt it.
13. \_\_\_\_\_ You should remove the computer cover monthly to clean inside.
14. \_\_\_\_\_ Surge protectors can help guard against lightning but may not be complete protection.
15. \_\_\_\_\_ Downloading from Internet sites could expose your computer to dangerous viruses.
16. \_\_\_\_\_ Keeping your computer dust free can help it last longer.
17. \_\_\_\_\_ Your mouse should never need cleaning.



18. \_\_\_\_\_ It will not hurt to eat a peanut butter and jelly sandwich while using the computer.
19. \_\_\_\_\_ Install one computer program, and then test your computer for problems before installing another computer program.
20. \_\_\_\_\_ If a computer system is grounded, it is all right to use it during an electrical storm.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Jeopardy PowerPoint Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Knowledge Gained</b>	All students in the group could easily and correctly state several facts about the topic used for the game without looking at class notes.	All students in the group could easily and correctly state one to two facts about the topic used for the game without looking at class notes.	Most students in the group could easily and correctly state one to two facts about the topic used for the game without looking at class notes.	Several students in the group could not correctly state facts about the topic used for the game without looking at class notes.	
<b>Rules</b>	Rules were written clearly enough that all could easily participate.	Rules were written, but one part of the game needed slightly more explanation.	Rules were written, but people had some difficulty figuring out the game.	The rules were not written.	
<b>Cooperative Work</b>	The group worked well together with all members contributing significant amounts of quality work.	The group generally worked well together with all members contributing some quality work.	The group worked fairly well together with all members contributing some work.	The group often did not work well together, and the game appeared to be the work of only one or two students in the group.	
<b>Creativity</b>	The group put a lot of thought into making the game interesting and fun to play as shown by creative questions, game pieces, and/or a game board.	The group put some thought into making the game interesting and fun to play by using textures, fancy writing, and/or interesting characters.	The group tried to make the game interesting and fun, but some of the things made it harder to understand/enjoy the game.	Little thought was put into making the game interesting or fun.	
<b>Total Score</b>					

**Scale:**

- 13–16     A    Excellent
- 9–12     B    Good
- 5–8      C    Needs Some Improvement
- 2–4      D    Needs Much Improvement
- 0–1      F    Not Appropriate

TOTAL = \_\_\_\_\_

**Comments:**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Computer Lab Safety Rubric

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Drawings/Diagrams</b>	Diagrams are labeled neatly and accurately.	Diagrams are included and are labeled neatly and accurately.	Diagrams are included and are labeled.	Needed diagrams are missing OR are missing important labels.	
<b>Spelling, Punctuation, and Grammar</b>	One or fewer errors in spelling, punctuation, and grammar	Two or three errors in spelling, punctuation, and grammar	Four errors in spelling, punctuation, and grammar	More than four errors in spelling, punctuation, and grammar	
<b>Lab Procedures</b>	Procedures are listed in clear steps. Each step is numbered and is a complete sentence.	Procedures are listed in a logical order, but steps are not numbered and/or are not in complete sentences.	Procedures are listed but are not in a logical order or are difficult to follow.	Procedures are not accurately listed.	
<b>Data</b>	Professional looking and accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representations of the data are in written form, but no graphs or tables are presented.	Data are not shown or are inaccurate.	
<b>Safety</b>	Attention to relevant safety procedures are listed and pose no safety threat to any individual.	Attention to relevant safety procedures is generally noted and poses no safety threat to any individual, but one safety procedure needs to be reviewed.	Attention to relevant safety procedures is generally noted and poses no safety threat to any individual, but several safety procedures need to be reviewed.	Attention to relevant safety procedures is ignored, and/or some aspect of the lab poses a threat to the safety of the student or others.	
<b>Total Score</b>					

Comments:

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Reading – Analyzing Information: Personality Profiles

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Identifies important information</b>	Student lists all the main points of the personality profile without having the personality profile in front of him or her.	Student lists all the main points but uses the personality profile for reference.	Student lists all but one of the main points, using the personality profile for reference. He or she does not highlight any unimportant points.	Student cannot decipher important information with accuracy.	
<b>Identifies details</b>	Student recalls several details for each main point without referring to the personality profile.	Student recalls several details for each main point but needs to refer to the personality profile occasionally.	Student is able to locate most of the details when looking at the personality profile.	Student cannot locate details with accuracy.	
<b>Summarization</b>	Student uses only one to three sentences to describe clearly what the personality profile is about.	Student uses several sentences to accurately describe what the personality profile is about.	Student summarizes most of the personality profile accurately but has some slight misunderstanding.	Student has great difficulty summarizing the personality profile.	
<b>Total Score</b>					

**Scale:**

- 10–12    A    Excellent  
7–9        B    Good  
4–6        C    Needs Some Improvement  
1–3        D    Needs Much Improvement  
0          F    Not Appropriate

TOTAL = \_\_\_\_\_

**Comments:**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Reading – Analyzing Information: Scenario

	<b>Exemplary 4 Points</b>	<b>Accomplished 3 Points</b>	<b>Developing 2 Points</b>	<b>Beginning 1 Point</b>	<b>Score</b>
<b>Identifies important information</b>	Student lists all the main points of the scenario without having the scenario in front of him or her.	Student lists all the main points but uses the scenario for reference.	Student lists all but one of the main points, using the scenario for reference. He or she does not highlight any unimportant points.	Student cannot decipher important information with accuracy.	
<b>Identifies details</b>	Student recalls several details for each main point without referring to the scenario.	Student recalls several details for each main point but needs to refer to the scenario occasionally.	Student is able to locate most of the details when looking at the scenario.	Student cannot locate details with accuracy.	
<b>Summarization</b>	Student uses only one to three sentences to describe clearly what the scenario is about.	Student uses several sentences to accurately describe what the scenario is about.	Student summarizes most of the scenario accurately but has some slight misunderstanding.	Student has great difficulty summarizing the scenario.	
<b>Total Score</b>					

**Scale:**

- 10–12    A    Excellent  
7–9        B    Good  
4–6        C    Needs Some Improvement  
1–3        D    Needs Much Improvement  
0            F    Not Appropriate

TOTAL = \_\_\_\_\_

**Comments:**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Role-play or Skit Rubric

	Excellent 4 Points	Good 3 Points	Needs Some Improvement 2 Points	Needs Much Improvement 1 Point	Score
Relates to audience					
Provides a fluent rendition of scenario					
Role-plays scenario with feeling and expression					
Varies intonation					
Presents characters appropriately					
Gives the scenario its full range					
Breaches easily identified					
<b>Total Score</b>					

**Scale:**

24–28     A     Excellent

19–23     B     Good

14–18     C     Needs Some Improvement

9–13      D     Needs Much Improvement

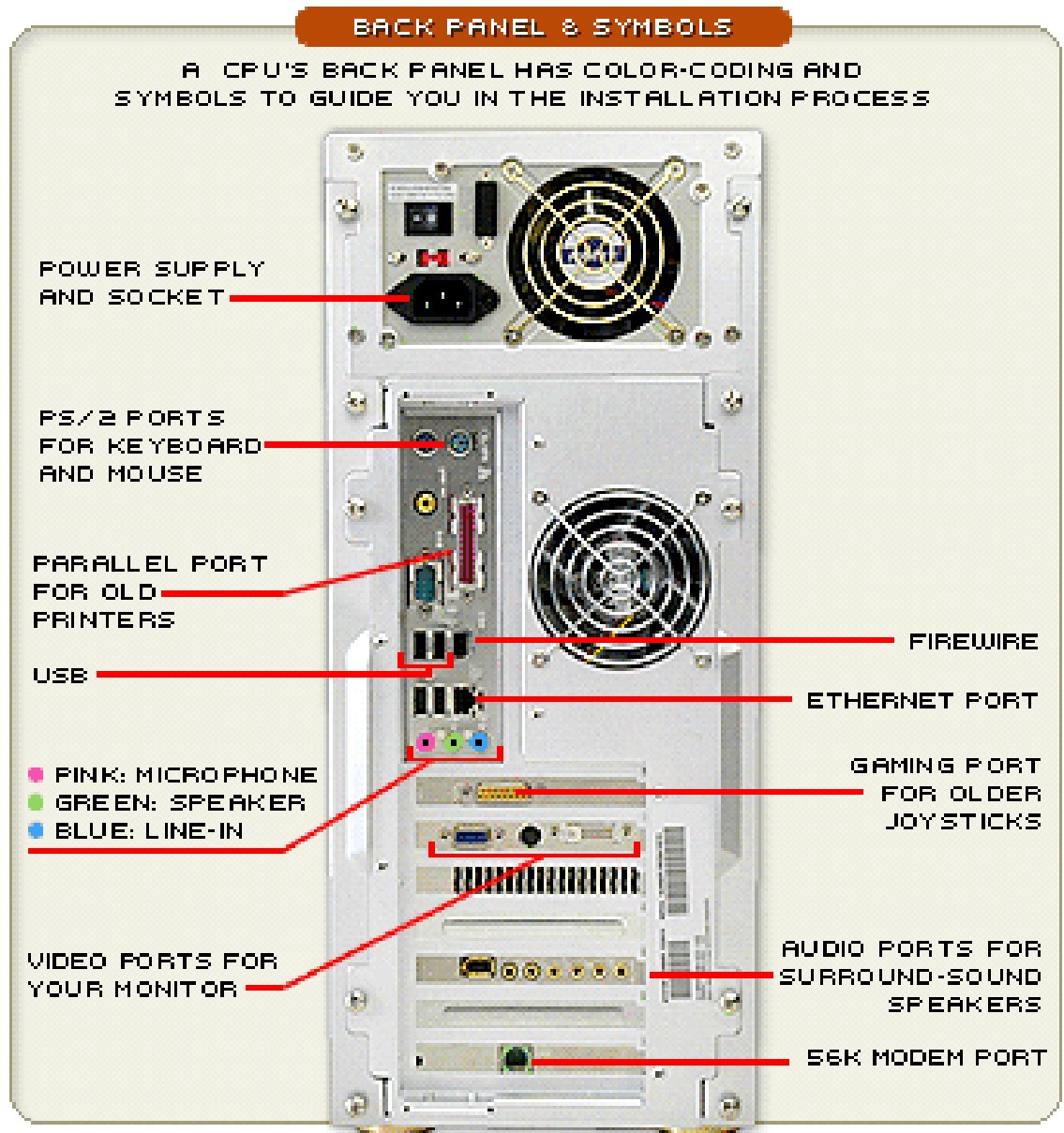
0–12      F     Not Appropriate

TOTAL = \_\_\_\_\_

**Comments:**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_  
Period: \_\_\_\_\_

## Diagram of a PC



## Unit 2: Ethics in the Game Design Industry

**Competency 1:** Research copyright rules, regulations, and issues related to graphics and images produced by others and original work, and adhere to those rules and regulations when developing work.  
(DOK1) VGD.05, VGD.76, VGD.78, VGD.79

### Suggested Enduring Understandings

1. Students will understand the issues that relate to copyright guidelines and violations.
2. Students will learn how to generate media from multiple copyrighted sources and to give proper credit to those who created those sources.

### Suggested Essential Questions

1. What is a copyright, and how is it important in the gaming industry?
2. Why should individuals be aware of the various copyright violations and predict the consequences?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Define terms related to copyright rules, regulations, and issues related to graphics and images produced by others and original work. (DOK1)</p>	<p>a. Use a multimedia presentation to discuss the terms related to copyrighting, and use the “vocabulary word maps” teaching strategy to help students grasp the terms. Additionally, have students create a dictionary that describes and has a picture of each vocabulary word. <small>CS1, CS2, CS4, E1, E2, E4, W2, W3, T3, T6</small></p> <p>Vocabulary words may include the following:</p> <ul style="list-style-type: none"> <li>• Fair use</li> <li>• Statute of limitations</li> <li>• Shareware</li> <li>• Freeware</li> <li>• Infringement</li> <li>• Model release</li> <li>• Patent</li> <li>• Trademark</li> <li>• Trade secret</li> <li>• Public domain</li> <li>• Peer to peer (P2P)</li> <li>• File sharing</li> <li>• Hacker</li> <li>• Intellectual property</li> <li>• License agreement <small>CS7, CS9, R4, T3, T6</small></li> </ul>	<p>a. Assess each student’s copyrighting/ethical knowledge with an electronic test administered through the Blackboard learning system.</p>
<p>b. Research copyright laws related to graphics, images, video games, sounds, and other original work. (DOK1)</p>	<p>b. Display graphics, images, songs, and other original work samples, use the “four corners” teaching strategy, and discuss the ethical dilemmas as they pertain to copyrighting and artist creativity. <small>CS7, CS10, CS11, T2, T6</small></p> <p>Have students research the problems of illegal downloading, copyright laws, and news articles</p>	<p>b. Participation Rubric</p> <p>Blog Rubric</p>



		about copyrighting violations. Have students take key points from approximately five Web sites. Lead the discussion, and post responses via Blogger or a discussion board.	
c. Give examples of copyright violations related to trademark, symbols, length of time, and public domain. (DOK 2)	c. Have students review the CyberBee flash Web site on copyright regulations ( <a href="http://www.cyberbee.com/cb_copyright.swf">www.cyberbee.com/cb_copyright.swf</a> ).  Have students complete "Ethics: A WebQuest" ( <a href="http://www.aacps.org/aacps/boe/INSTR/CURR/COMED/HSWebQuest/EthicsQuest/index.htm">http://www.aacps.org/aacps/boe/INSTR/CURR/COMED/HSWebQuest/EthicsQuest/index.htm</a> ) about copyright laws. Students will present a poster on their findings.  Provide students with case studies involving copyright violation related to trademark, symbols, length of time, and public domain. Have students work in teams to analyze the case studies analyzing and developing ways to prevent breaking copyright rules and regulations. Students will present their findings to the class through a simple oral presentation. <sup>T1, T2, T3</sup>		c. Poster Rubric  WebQuest Rubric  Presentation Rubric
d. Prepare images, songs, sounds, and video that meet copyright guidelines. (DOK1)	d. Discuss the points from "The Learning Page—Getting Started" ( <a href="http://www.loc.gov">www.loc.gov</a> ). Demonstrate to students how to get permission and give credit to an author for his or her work. <sup>CS1, CS9, CS10, CS11, CS15, T5, T6</sup>  Explain how to search for legal use clip art, graphics, songs, and sounds. <sup>CS1, CS9, CS10, CS11, CS15, T1, T2, T3, T4, T5, T6</sup>  Have students create a PhotoStory with graphics and songs from the Internet.		d. PhotoStory Rubric

**Competency 2:** Research online content, and evaluate content bias, currency, and source. (DOK1) <sup>VGD.76</sup>

**Suggested Enduring Understandings**

1. When researching information, especially online, it is necessary to look for clarity, currency, and relevancy.
2. Students should grasp the relevance of Web sites as it pertains to their viability as an academic reference.

**Suggested Essential Questions**

1. What are some ways to research?
2. How are the terms clarity, currency, and relevancy essential to researching?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Determine how to search for information online. (DOK 1) <sup>W1, W2, W3, W4, W5</sup>	a. Review information on the Web site "Checklist for Evaluating Web Sites," and give students an opportunity to view the evaluation checklist ( <a href="http://www.lib.umd.edu/guides/webcheck.html">http://www.lib.umd.edu/guides/webcheck.html</a> ). <sup>CS9, CS10, CS11, T5, T6</sup>	a. Web Evaluation Rubric  Presentation Rubric

Review teacher-selected Web sites on clarity, currency, and relevancy, and have students evaluate them using the Web Page Evaluation Form at [www.ncsu.edu/midlink/tutorial/www.eval.html](http://www.ncsu.edu/midlink/tutorial/www.eval.html).<sup>CS9,</sup>  
CS10, CS11, T5, T6

Review Web page techniques and strategies for searching on the Web. Have student groups create a brief PowerPoint on the Web page techniques and strategies that could be used to present to non-DMT students.

- |  |   |                |
|--|---|----------------|
| b. Correlate information with multiple sources. (DOK2) <sup>R3, W1</sup> | b. Read and discuss the articles “Wikipedia Founder Discourages Academic Use of His Creation Wikipedia” and “Americans Use Multiple Research Sources.” Have students critique the articles and present the different points of view on researching using Blogger. <sup>CS9, CS10,</sup><br>CS11, R1, R5, T3, T4 | b. Blog Rubric |
|--|---|----------------|

**Competency 3: Define and abide by the game designer’s code of ethics. (DOK1)**<sup>VG.D.05, VGD.79</sup>

**Suggested Enduring Understandings**

1. In game design, certain standards of ethics must be examined and applied.
2. Students will be able to differentiate between the varying industry game ratings.

**Suggested Essential Questions**

1. Game designers must abide by certain codes of ethics. Why is this necessary to this profession?
2. How can games be detrimental to a person’s physical being and psyche? Beneficial?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Define terms related to the game design code of ethics. (DOK1) <sup>T4, W5</sup>	<p>a. Create a Jeopardy game based on game design technology terms.<sup>CS9, CS10, CS11, T5, T6</sup></p> <p>Examine the “Gama Network” Web page, and have students brainstorm and discuss the points from the Ethics of Game Design article in small groups. Have a group spokesperson report the group consensus to the group.<sup>CS1, CS7, CS9, CS10, CS11, CS14, T1, T2, T3, T5, T6</sup></p> <p>Review codes of ethics from various organizations. Help students learn to write codes of ethics, policies, and/or standards for the workplace.<sup>CS3, CS4, T1, T2, T3, T4, T5, T6</sup></p> <p>Vocabulary words may include the following:</p> <ul style="list-style-type: none"> <li>• Media bias</li> <li>• Virtues</li> <li>• Sensationalism</li> <li>• Double standard</li> <li>• Censorship</li> </ul>	<p>a. Vocabulary test</p> <p>Peer Evaluation Rubric</p> <p>Code of Ethics Rubric</p>

	<ul style="list-style-type: none"> <li>• Immoral</li> <li>• Morals</li> <li>• Values</li> <li>• Free expression</li> <li>• Propaganda</li> <li>• Ethics</li> <li>• Editorial</li> <li>• Rating system</li> <li>• Advocate</li> </ul>	
b. Identify the similarities and differences between game ratings. (DOK 2) <sup>S1, R5</sup>	b. Discuss and locate examples of game ratings on teacher-selected games, and discuss the similarities and differences. Have students create a chart that compares and contrasts the two. <sup>CS8, CS9, CS10, CS11, CS14, T2, T4, T5</sup>	b. Compare and Contrast Chart Rubric
c. Demonstrate the ability to create and follow a personal code of ethics. (DOK 2)	c. Have a guest speaker from the local newspaper talk to students on the aforementioned topics. <sup>CS1, CS8, T2</sup>  Have students summarize what was discussed from the speaker's presentation.  Create a PowerPoint slide show explaining your personal code of ethics for game design technology.	c. Presentation Rubric  Speaker Summary Rubric
d. Demonstrate proper use of pictures, sound bites, and videos. (DOK 1)	d. Discuss with the students how to properly utilize pictures, sound bites, and videos. <sup>CS8, CS9, CS10, CS11, CS16, T4, T5, T6</sup>  Have students work in teams of two to three to research the proper use of pictures, sound bites, and videos. Have students find an article related to each topic. Have students create a wiki defining, discussing, and showing an example of proper use and showing an example of improper use.	d. Wiki Rubric
e. Discuss plagiarism and the consequences of plagiarizing. (DOK1)	e. Guide students through the "Plagiarism Court" Flash tutorial. <sup>CS1, CS8, CS9, CS10, CS11, CS16, T4, T5, T6</sup>  Have students complete the module "The Consequences of Plagiarism" ( <a href="http://www.fairfield.edu/library/lib_plagiarismcourt.html">http://www.fairfield.edu/library/lib_plagiarismcourt.html</a> ).  Students will write a two-page essay defining plagiarism, its consequences, and how to give credit for another's work.	e. Essay Rubric
f. Describe the Philosophical Approach to Morality and the consequentialist theory. (DOK 1)	f. Examine the Philosophical Approach to Morality and the consequentialist theory. <sup>CS1, CS7, CS16, T4</sup>  Have the following quote posted on the Blackboard announcements section:  "It's easy for each of us to make a personal judgment about the moral status of a game—just think about the choices you have to take to win, and consider what they say about you."—Ren Reynolds, strategic consultant for ethics of technology  Use the following questions to facilitate conversation:	f. Script Rubric

- 
- What does Mr. Reynolds mean by this quote?
  - What does this quote mean to you?
  - How could a game design-organization lose its credibility?
  - What would happen if a game design organization lost its credibility?

Have students read the “Playing a Good Game: A Philosophical Approach to Understanding the Morality of Games” article: <http://www.reynolds.com/downloads/Playing%20a%20Good%20Game%20-%20-%20A%20Philosophical%20Approach%20to%20Understanding%20the%20Morality%20of%20Games.pdf>.

Have students provide alternatives to violence in game design. Give students made-up scenarios of games that involve details such as stealing, gang crime, and so forth. Have students create a script that gives the consequences of such actions and how it can be prevented.

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# Standards

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## **IGDA Standards**

- VG.D.05 Experience of Play
- VG.D.76 Intellectual Property
- VG.D.78 Contracts
- VG.D.79 Content Regulation

## **21st Century Learning Standards**

- CS1 Global Awareness
- CS2 Financial, Economic, Business and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS4 Health Literacy
- CS7 Critical Thinking and Problem Solving
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy
- CS14 Social and Cross-Cultural Skills
- CS15 Productivity and Accountability
- CS16 Leadership and Responsibility

## **National Educational Technology Standards for Students**

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T5 Digital Citizenship
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- E4 Sentence Structure and Formation
- R1 Main Ideas and Author's Approach
- R4 Meaning of Words
- W2 Focusing on the Topic
- W3 Developing a Position

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

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For additional references, activities, and Web resources, please refer to the Game Design and Development Technology P.A.C.E. Web site at <http://www.rcu.blackboard.com> (available only to registered users).

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Article Critique Rubric

	5 Points	4 Points	3 Points	2 Points	1 Point	Score
<b>Grammar</b>	Spelling, sentence formation, and paragraphing are 100% correct.	Few spelling and sentence errors. Paragraphs are correct.	Few spelling and sentence errors and no paragraph errors	Some spelling errors and incomplete sentences; no paragraph errors	Some spelling errors and incomplete sentences; no more than one paragraph error	
<b>Content</b>	Article content is summarized in a clear manner and can be easily understood and followed.	Article content is summarized in a clear manner. Thoughts can be understood and followed.	Article content is summarized in a somewhat clear manner. There are some questions about interpretation of the article.	Summarized article content is in vague terms; while somewhat cohesive, there are a few questions about summary of the article.	Summarized article content is in vague terms and is not cohesive; there are many questions about interpretation of the article.	
<b>Content Accuracy</b>	All content throughout the presentation is accurate. There are no factual errors.	Most of the content is accurate, but there is one piece of information that might be inaccurate.	The content is generally accurate, but one piece of information is clearly flawed or inaccurate.	Content is typically confusing or contains more than one factual error.	Content contains multiple factual errors and does not relate to the assigned topic.	
<b>Total Score</b>						



Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Compare and Contrast Chart Rubric

	5 Points	4 Points	3 Points	2 Points	1 Point	Score
<b>Factual Content</b>	All facts are reported correctly.	One or two mistakes are made in reporting the cultural information.	Three or four factual mistakes are made in reporting the cultural information.	Five or six factual mistakes are made in reporting the cultural information.	Over seven mistakes are made in reporting the cultural information.	
<b>Spelling and Grammar</b>	No spelling or grammar mistakes are made.	One or two grammatical or spelling mistakes are made.	Three or four grammatical or spelling mistakes are made.	Five or six grammatical or spelling mistakes are made.	Over seven grammatical or spelling mistakes are made.	
<b>Overall Appearance</b>	The appearance of the chart is appealing and pleasing to the eye. A great deal of effort is spent on the overall presentation of the project.	The project is appealing to the eye, but there seems to be some lack of effort in the overall presentation of the project.	The project does not stand out among others, but it fulfills the minimum requirement. Student put little effort into the project.	The overall appearance is sloppy and unappealing to the eye. Student put little or no effort in making the project presentable.	Student put no effort into the appearance of the project, and the project is completely unappealing to the eye.	
<b>Total Score</b>						

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Peer Evaluation Rubric

	<b>3 Points</b>	<b>2 Points</b>	<b>1 Point</b>	<b>Score</b>
<b>Preparedness</b>	Group member had read and understood the assigned articles.	Group member had partially read and understood the assigned articles.	Group member had not read the assigned articles.	
<b>Participation</b>	Group member had many ideas to share with the group and participated fully in the discussion.	Group member participated intermittently.	Group member had minimal to no participation in the group discussion.	
<b>Overall Contribution to the Group</b>	Group member was an active leader and participated in the group assignment from start to finish.	Group member intermittently provided assistance to the group.	Group member did not contribute to the group activity.	
<b>Total Score</b>				

## Unit 3: Games and Society

**Competency 1:** Understand how games reflect and construct individuals and groups. (DOK1) VGD.03, VGD.04, VGD.05, VGD.06

### Suggested Enduring Understandings

1. It is important for students to learn how the game design and development industry began and how it has evolved.
2. Game genres are categories based on a combination of subject matter, setting, screen presentation/format, player perspective, and game-playing strategies.

### Suggested Essential Questions

1. What are some of the significant milestones in the history of game development?
2. How has the video game industry affected society?
3. What motivates people to play video games?
4. What is the focus of a game’s genre?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Discuss the historical aspects of game design and development technology in order to analyze the emergence of the “culture” of gaming. (DOK1)</p>	<p>a. Explore the significant events that lead to the discovery and inventions of game design and development. Students will conduct an Internet scavenger hunt to find the significant events leading up to the creation of the game design and development industry. <small>CS1, CS8, CS9, CS10, CS11, CS12, T2, T3, T6</small></p> <p>Students will work in groups to create a graphic time line poster revealing the most significant milestones in the history of game design. They will present it to the class.</p> <p>Show students examples of teacher-selected games to include all formats.</p> <p>Terms may include the following:</p> <ul style="list-style-type: none"> <li>• EDSAC</li> <li>• Artificial intelligence</li> <li>• SEGA</li> <li>• Arcade</li> <li>• Computer games</li> <li>• Activision</li> <li>• Magnavox</li> <li>• Nintendo</li> <li>• Consoles</li> <li>• Handhelds</li> <li>• PLATO</li> <li>• MUDS</li> <li>• Convergence</li> <li>• Emulators</li> </ul> <p>Students will conduct an Internet scavenger hunt</p>	<p>a. Group Participation Rubric</p> <p>Poster and Presentation Rubric</p>

	<p>to find the significant events leading up to the creation of the game design and development industry.</p> <p>Groups of students will create a graphic time line poster revealing the most significant milestones in the history of game design and development technology. They will then present it to the class.</p>	
<p>b. Discuss the game market and the reasons why people play video games. (DOK1)</p>	<p>b. Describe the game market and what motivates people to play video games. Ask the students to identify their reasons for playing video games using the following terms related to player motivation.</p> <ul style="list-style-type: none"> <li>• Social interaction</li> <li>• Physical seclusion</li> <li>• Competition</li> <li>• Knowledge</li> <li>• Mastery</li> <li>• Escapism</li> <li>• Addiction</li> </ul> <p style="text-align: right; margin-right: 20px;"><small>CS1, CS8, CS9, CS10, CS11, CS12, W5, T2, T3, T6</small></p> <p>Students will identify their personality traits relative to their reason(s) for playing video games by taking the VAL Personality Survey at <a href="http://www.sric-bi.com/VALS/presurvey.shtml">http://www.sric-bi.com/VALS/presurvey.shtml</a> and the Myers-Briggs survey at <a href="http://www.humanmetrics.com/cgi-win/JTypes2.asp">http://www.humanmetrics.com/cgi-win/JTypes2.asp</a>. Students will orally present the results of the survey to the class.</p>	<p>b. Participation Rubric</p>
<p>c. Understand the key elements in game design and development technology. (DOK1)</p>	<p>c. Describe what motivates people to play games, the types of games they play, and how this has been affected by geographic, demographic, and psychographic influences. <small>CS1, CS8, CS9, CS10, CS11, CS12, T2, T3, T6</small></p> <p>Give student variations of games, and allow them to identify their categorization based on the following categories:</p> <ul style="list-style-type: none"> <li>• Applications</li> <li>• Platforms</li> <li>• Time interval</li> <li>• Player mode</li> <li>• Simulations</li> <li>• MMOGs</li> <li>• MMORPGs</li> </ul>	<p>c. Compare and Contrast Chart Rubric</p>
<p>d. Demonstrate an understanding of game genres. (DOK1)</p>	<p>d. Identify game genres and subgenres.</p> <ul style="list-style-type: none"> <li>• Action</li> <li>a. Platformers</li> <li>b. Shooters</li> <li>c. Racing</li> <li>d. Fighting</li> </ul>	<p>d. Teacher observation</p>

- Adventure
- Action–Adventure
- Casino
- Puzzle
- Role-play
  - a. Vehicle
  - b. Process (Construction and Management)
  - c. Sports and Participatory
- Strategy
  - a. Turn-Based Strategy (TBS)
  - b. Real-Time Strategy (RTS)
- Massively Multiplayer Online Games (MMOG's)<sup>C9, C10, T3</sup>

Give students variations of games, and allow them to identify their categorization. Students will list names of games that are identifiable in each genre and explain why.

**Competency 2:** Research and identify careers and roles within the game design and development industry. (DOK2)  
VGD.03, VGD.04, VGD.05, VGD.06

**Suggested Enduring Understandings**

1. It is important for students to learn the careers that are available to them upon graduation from high school, community colleges, and 4-year colleges.
2. Students will be introduced to the organizational structure of a typical game design organization.

**Suggested Essential Questions**

1. What positions and titles are available in the game design and development industry?
2. What are the requirements to obtain these positions?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe the responsibilities of producers, programmers, artists, designers, riggers, animators, modelers, writers, and quality assurance personnel function in relation to the daily operation of a game design company to include budgets, schedules, personnel, and tracking progress. (DOK1)</p>	<p>a. Students will use the online <i>Occupational Outlook Handbook</i> (<a href="http://www.bls.gov/oco/">http://www.bls.gov/oco/</a>) and the <i>IGDA Breaking In</i> (<a href="http://www.igda.org/breakingin/career_pat_hs.htm">http://www.igda.org/breakingin/career_pat_hs.htm</a>) to select an area of occupational interest.</p> <p>Students will research salary, work environment, and educational requirements for the chosen career and prepare a two-page summary in Modern Language Association (MLA) report format.</p> <p>Students will use the charts at <a href="http://www.payscale.com/research/US/Job=Video_Game_Designer/Salary">http://www.payscale.com/research/US/Job=Video_Game_Designer/Salary</a>, <a href="http://www.animationarena.com/game-design-salaries.html">http://www.animationarena.com/game-design-salaries.html</a>, and <a href="http://www.adigitaldreamer.com/articles/game-design-salary.htm">http://www.adigitaldreamer.com/articles/game-design-salary.htm</a> to find current salary</p>	<p>a. Career Research and Development Rubric</p>

	information for game-related careers.	
	Other resources include <a href="http://www.blizzard.com/us/jobopp/">http://www.blizzard.com/us/jobopp/</a> .	
b. Discuss the job outlook for producers, programmers, artists, designers, and quality assurance personnel. (DOK1)	b. Using the <i>Occupational Outlook Handbook</i> at <a href="http://www.bls.gov/oco">http://www.bls.gov/oco</a> , the Mississippi Department of Employment Security (MDES) Labor Market Information at <a href="http://www.mdes.ms.gov/wps/portal/">http://www.mdes.ms.gov/wps/portal/</a> , and the <i>Game Developer 2008 Career Guide</i> , students will research the job outlook for said careers and provide data in the MLA report. CS1, CS8, CS9, CS10, CS11, CS12, R5, T2, T3, T6	b. Career and Development Rubric
c. Understand the organizational structure of a game design company. (DOK1)	c. Referring to the <i>Game Developer 2008 Career Guide</i> and utilizing application software, students will complete an organizational chart. The chart will use preproduction, production, and postproduction as the main categories and identify the areas in which various job descriptions function.	c. Teacher observation for accuracy

**Competency 3: Develop a professional portfolio.** VGD.03, VGD.04, VGD.05, VGD.06

Suggested Enduring Understandings	Suggested Essential Questions
1. Portfolios communicate accomplishments, works in progress, or personal history. Students can use portfolios to showcase their work when applying for a job.	1. What software is available for the creation of portable document format (PDF) portfolios? 2. How can students successfully display their work electronically?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Research career areas in design and/or print production. (DOK1) <sup>E1, E2, E4, E5, E6</sup>	a. Have students research careers in game design and then select the focus for their portfolios based on their research (creative/art director, producer, director, layout artist, animator, modeler, rigger, illustrator, photo editor, and photographer). <sup>CS1, CS8, CS9, CS10, CS11, CS12, T2, T3, T6</sup>  Have students choose a career from their research and write a three- to five-paragraph essay explaining why they would choose this career over the other careers they researched. <sup>CS1, CS8, CS9, CS10, CS11, CS12, E1, E2, W2, W4, T2, T3, T6</sup>	a. Essay Rubric
b. Identify the purpose of a portfolio as it relates to career planning. (DOK2)	b. Discuss the following goals of a portfolio: <ul style="list-style-type: none"> <li>• Understand goals and uses of portfolios.</li> <li>• Research career areas in design and/or print production.</li> <li>• Plan and create a flowchart for a portfolio.</li> <li>• Select and organize content for a PDF portfolio. <sup>CS1, CS8, CS9, CS10, CS11, CS12, T2, T3, T6</sup></li> </ul> <p>Discuss the concept of a portfolio, its purpose,</p>	b. Assign students a worksheet to complete answering questions regarding the goals of the portfolio project as well as the concepts of the portfolio, its purpose, and its

	<p>and its audience.</p> <ul style="list-style-type: none"> <li>• What is a portfolio?</li> <li>• What are the goals of a particular portfolio?</li> <li>• What does a portfolio contain?</li> <li>• Would it contain professional experiences? Course work?</li> <li>• How do you use a portfolio to communicate ideas?</li> <li>• What could you use to communicate these ideas (images, text, page layout, and organization of the portfolio)?</li> <li>• What are the long-term and short-term goals of a portfolio?</li> <li>• Who is the audience for the portfolio? <sup>CS1, CS8, CS9, CS10, CS11, CS12, T2, T3, T6</sup></li> </ul> <p>Show examples of portfolios—both paper-based and online—and analyze their purpose and audience with students. Students will select files they could include in their portfolios that would represent their best work and highlight their skills. <sup>CS1, CS8, CS9, CS10, CS11, CS12, T2, T3, T6</sup></p> <p>Explain the expectations of the portfolio: <sup>CS1, CS8, CS9, CS10, CS11, CS12, T2, T3, T6</sup></p> <ul style="list-style-type: none"> <li>• Portfolio introduction explaining skill set, training, projects included in portfolio, career interests and goals, and any professional experience</li> <li>• Narrative introductions to each project, explaining the ways their work highlights their skills</li> <li>• Narrative introductions including specific examples comparing their skills with the career area in which they are interested</li> <li>• Learning plan that identifies skills or concepts they might be lacking at this point but would want to learn about and focus on</li> <li>• Web photo gallery of images to link to their photography work</li> </ul>	<p>audience for a grade.</p> <p>Graded flowchart</p>
<p>c. Construct a portfolio. (DOK3)</p>	<p>c. Students will construct their PDF portfolios, creating any assets in Photoshop and creating the layout and text in Word, using the various lessons learned.</p> <p>Students will export final portfolio content from Word to Acrobat to create a PDF portfolio. Students will create bookmarks in the PDF as well as any internal and external links they gathered earlier.</p> <p>Guide: <i>How to Create a PDF Portfolio</i></p>	<p>c. Portfolio Project Rubric</p>

Guide: *How to Create Links*  
 Guide: *How to Create and Organize Bookmarks*

- |                                |  |                           |
|--------------------------------|--|---------------------------|
| d. Present a portfolio. (DOK1) | d. Students will partner for the purpose of testing each other’s PDF portfolios. Students will finalize their PDF portfolios and make a version that can be printed and a lighter version (smaller file size) for use on the Web or to e-mail. | d. Peer Evaluation Rubric |
|--------------------------------|--|---------------------------|

**Competency 4: Discuss the future of video games.(DOK1)** VGD.03, VGD.04, VGD.05, VGD.06

**Suggested Enduring Understandings**

**Suggested Essential Questions**

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. It is important for students to assess present technology and forecast the effect of future technology on the game design and development technology industry.</li> <li>2. Game design is a work in progress even after its release.</li> </ol> | <ol style="list-style-type: none"> <li>1. What kinds of projects can students anticipate in the workplace?</li> <li>2. How might emerging technologies change the game design and development industry?</li> <li>3. What types of games, elements, formats, and genres are anticipated in the future?</li> </ol> |
|---|--|

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
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a. Research the future of game design and development in terms of new technology and education. (DOK1)	a. Have students use the following: <ul style="list-style-type: none"> <li>• <a href="http://thedartmouth.com/2009/04/14/news/games/">http://thedartmouth.com/2009/04/14/news/games/</a></li> <li>• <i>Game Design and Development Essentials</i>, Second Edition: chapter 1, page 34, and conclusion, pages 398–420.</li> </ul> <p>Create a blog allowing each student to discuss how emerging technologies may affect the following 5 and 10 years from now: <small>CS1, CS8, CS9, CS10, CS11, CS12, CS14, T1, T2, T3, T6</small></p> <ul style="list-style-type: none"> <li>• Game design and graphics</li> <li>• Game formats and platforms</li> <li>• Game hardware</li> <li>• Genres</li> <li>• MMOGs</li> <li>• Simulations</li> <li>• Who will play the games</li> </ul>	a. Blog Rubric
b. Discuss the concept of an “ideal” game of the future. (DOK1)	b. Discuss the blogs posted by the students, and ask students what they can contribute to the game design and development industry in the future. <small>CS1, CS8, CS9, CS10, CS11, CS12, CS14, T1, T2, T3, T6</small> <p>Suggest that improvements can be made to all aspects of games including but not limited to music, sound effects, graphics, realism, voice-overs, pricing, marketing, and playability. <small>CS1, CS8, CS9, CS10, CS11, CS12, CS14, T1, T2, T3, T6</small></p> <p>Have students work in groups to create their ideal game for the future. Students should list at least five categories for improvement.</p>	b. Group Participation Rubric



# Standards

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## **IGDA Industry Standards**

- VG.D.03 Players and Effects
- VG.D.04 History
- VG.D.05 Experience of Play
- VG.D.06 Construction of Games and Game Technologies

## **21st Century Learning Standards**

- CS1 Global Awareness
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy
- CS12 Flexibility and Adaptability
- CS14 Social and Cross-Cultural Skills

## **National Educational Technology Standards for Students**

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- R5 Generalizations and Conclusions
- W2 Focusing on the Topic
- W4 Organizing Ideas
- W5 Using Language

## References

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For additional references, activities, and Web resources, please refer to the Game Design and Development Technology P.A.C.E. Web site at <http://rcu.blackboard.com> (available only to registered users).

## **Suggested Rubrics and Checklists**

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Participation Rubric

	<b>Beginning 1 point</b>	<b>Developing 2 points</b>	<b>Accomplished 3 points</b>	<b>Exemplary 4 points</b>	<b>Score</b>
<b>Group Discussions</b>	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
<b>On-Task Behavior</b>	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
<b>Helping Others</b>	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
<b>Listening</b>	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
<b>Total Score</b>					

**Comments:**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Career Research and Development Rubric

	<b>Does Not Meet Expectations 0</b>	<b>Meets Expectations 3</b>	<b>Exceeds Expectations 5</b>	<b>Score</b>
<b>Research</b>	Absent or incomplete	Research covers design and/or print production career area. Research is evident in the portfolio content, providing such information as job description, qualifications, skill set, technical knowledge, required training, and salary information.	Research clearly covers a specific design and/or print production career area. Research is evident in the portfolio content, providing specific information and examples such as job description, qualifications, skill set, technical knowledge, required training, and salary information.	
<b>Flowchart</b>	Absent or incomplete	Flowchart is detailed and includes an appropriate organizational structure for the planned content.	Flowchart is detailed and includes a clear and logical organizational structure for the planned content. Flowchart includes all content that should go in the PDF portfolio.	
<b>Learning plan</b>	Absent or incomplete	Learning plan identifies the skills and concepts the student is interested in learning.	Learning plan clearly identifies the skills and concepts tied to the job or higher education program areas the student is interested in pursuing.	
<b>PDF portfolio – content</b>	Absent, incomplete, or unfocused	The PDF portfolio highlights the student’s completed projects and includes an introduction and descriptive narratives for each project. The PDF portfolio highlights skills relevant to design and/or the print production career area that interests the student.	The PDF portfolio is well organized and clearly highlights the student’s completed projects. The PDF portfolio includes a clear and concise introduction and descriptive narratives for each project that relates to and clearly highlights the design and/or print production career area that interests them.	
<b>PDF portfolio – design</b>	Absent, incomplete, or unfocused	Overall design of the PDF portfolio and highlighted projects employs appropriate use of design principles, layout design,	The overall design of the PDF portfolio and highlighted projects employs effective use of design principles, layout design, image composition, color theory, and	

		<p>image composition, color theory, and typography.</p> <p>The PDF portfolio showcases the student's technical skills in Photoshop, InDesign, and Acrobat. The PDF portfolio's organization includes use of links and bookmarks in Acrobat.</p>	<p>typography for showcasing student work to potential employers. The PDF portfolio clearly showcases the student's technical skills in Photoshop, InDesign, and Acrobat. The PDF portfolio's organization includes efficient and appropriate use of links and bookmarks.</p>	
<b>Peer review</b>	Absent or incomplete	<p>The peer review expresses both strengths and weaknesses of the PDF portfolio and offers suggestions for improvement. The peer review considers how the portfolio supports career goals.</p>	<p>The peer review expresses both strengths and weaknesses of the PDF portfolio. The reviewer offers clear suggestions for improvement and provides specific examples. The peer review considers and offers suggestions on how to strengthen the portfolio to support career goals.</p>	
<b>Total Score</b>				

**Comments:**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Compare and Contrast Chart Rubric

	5 Points	4 Points	3 Points	2 Points	1 Point	Score
<b>Factual Content</b>	All facts are reported correctly.	One or two mistakes are made in reporting the cultural information.	Three or four factual mistakes are made in reporting the cultural information.	Five or six factual mistakes are made in reporting the cultural information.	Over seven mistakes are made in reporting the cultural information.	
<b>Spelling and Grammar</b>	No spelling or grammar mistakes are made.	One or two grammatical or spelling mistakes are made.	Three or four grammatical or spelling mistakes are made.	Five or six grammatical or spelling mistakes are made.	Over seven grammatical or spelling mistakes are made.	
<b>Overall Appearance</b>	The appearance of the chart is appealing and pleasing to the eye. A great deal of effort is spent on the overall presentation of the project.	The project is appealing to the eye, but there seems to be some lack of effort in the overall presentation of the project.	The project does not stand out among others, but it fulfills the minimum requirement. The student put little effort into the project.	The overall appearance is sloppy and unappealing to the eye. The student put little or no effort in making the project presentable.	The student put no effort into the appearance of the project, and the project is completely unappealing to the eye.	
<b>Total Score</b>						

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Career Research and Development Rubric

	<b>Does Not Meet Expectations 0 Points</b>	<b>Meets Expectations 3 Points</b>	<b>Exceeds Expectations 5 Points</b>	<b>Score</b>
<b>Research</b>	Absent or incomplete	Research covers a design and/or print production career area by going to specific job-recruitment Web sites. Research is evident in the portfolio content by providing career information such as job description, qualifications, skill set, technical knowledge, required training, and salary information.	Research clearly covers a specific design and/or print production career area by going to specific job recruitment Web sites. Research is evident in the portfolio content by providing specific career information and examples such as job description, qualifications, skill set, technical knowledge, required training, and salary information.	
<b>Review and Redesign</b>	Absent or incomplete	Review and redesign analyzes the necessary changes to the original portfolio and plans and manages the content. Review and redesign considers and assesses intended career and/or education goals and changes the initial purpose and audience accordingly.	Review and redesign analyzes the necessary changes to the original portfolio and plans and manages the content. Review and redesign carefully considers and assesses intended lifelong career and/or education goals and changes the initial purpose and audience accordingly.	
<b>Peer Review</b>	Absent or incomplete	Peer review expresses both strengths and weaknesses of the planned changes to the PDF portfolio. The reviewer offers suggestions for improvement and considers how the portfolio supports career goals.	The peer review expresses both strengths and weaknesses of the planned changes to the PDF portfolio. The reviewer offers clear suggestions for improvement and provides specific examples. The reviewer considers and offers suggestions on how to strengthen the portfolio to support career goals.	
<b>Flowchart</b>	Absent or	The flowchart is detailed and includes an appropriate organizational	The flowchart is detailed and includes a clear and logical organizational structure for the	



	incomplete	structure for the planned content.	planned content. The flowchart includes all content that should go in the PDF portfolio.	
<b>PDF portfolio - content</b>	Absent, incomplete, or unfocused	The PDF portfolio highlights the student's completed projects, and the information is geared toward a specific career goal and audience. The PDF portfolio includes descriptive narratives for each project, highlighting skills relevant to the design and/or print production career area of interest.	The PDF portfolio highlights the student's completed projects and is well organized, and the information is geared toward a specific career goal and audience. The PDF portfolio includes clear and descriptive narratives for each project, highlighting skills relevant to the design and/or print production career area of interest.	
<b>PDF portfolio - design</b>	Absent, incomplete, or unfocused	The overall design of the PDF portfolio and highlighted projects employs appropriate use of design principles, layout design, image composition, color theory, and typography. The PDF portfolio showcases the student's technical skills in Photoshop, InDesign, Illustrator, and Acrobat. The PDF portfolio's organization includes links and bookmarks.	The overall design of the PDF portfolio and highlighted projects employs design principles, layout design, image composition, color theory, and typography that allow the portfolio to meet the goal of showcasing student work to potential employers. The PDF portfolio clearly showcases the student's technical skills in Photoshop, InDesign, Illustrator, and Acrobat. The PDF portfolio's organization includes efficient and appropriate use of links and bookmarks.	
<b>Presentation</b>	Absent or incomplete	The overall design of the PDF portfolio and highlighted projects employs appropriate use of design principles, layout design, image composition, color theory, and typography. The PDF portfolio showcases the student's technical skills in Photoshop, InDesign, Illustrator, and Acrobat. The PDF portfolio's organization includes links and bookmarks.	The overall design of the PDF portfolio and highlighted projects employs design principles, layout design, image composition, color theory, and typography that allow the portfolio to meet the goal of showcasing student work to potential employers. The PDF portfolio clearly showcases the student's technical skills in Photoshop, InDesign, Illustrator, and Acrobat. The PDF portfolio's organization includes efficient and appropriate use of links and bookmarks.	
<b>Total Score</b>				

**Comments:**

## Unit 4: Game Design Theory and Mechanics

**Competency 1:** Identify the core components of game design theory and mechanics. (DOK1) VGD.01, VGD.02, VGD.07, VGD.61

### Suggested Enduring Understandings

1. Students should learn the theory related to game design and development as well as the elements of design.
2. Understanding the basics of a storytelling and story structure is a key element to developing a cohesive game.

### Suggested Essential Questions

1. What are some of the applications associated with game development?
2. What are some of the elements and trends in game design?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the core components of game design theory and mechanics. (DOK1)	<p>a. Show students examples of game applications and simulations, and identify design elements while formulating an outline for the “ideal game” and how the designs reach the organization’s target audience and meet the goals of the company. <small>CS7, CS9, CS10, CS11, T2, T4, T6</small></p> <p>Terms may include the following:</p> <ul style="list-style-type: none"> <li>• Gameplay</li> <li>• Platforms</li> <li>• Artificial intelligence</li> <li>• Chunking</li> <li>• Dynamics</li> <li>• Emergence</li> <li>• Balance</li> <li>• Cheating</li> <li>• Pathfinding</li> <li>• Flocking</li> <li>• Agents</li> <li>• Scripting</li> <li>• Storytelling</li> <li>• Strategy <small>CS7, CS9, R4, T3, T6</small></li> </ul> <p>Students will define the terms listed on the Design Theory and Mechanics Worksheet.</p>	a. Written test to assess knowledge of terms
b. Discuss storytelling traditions and how they influence game ideas. “A good game is like a good novel. You fall in love with the characters, and—though details might fade—when you come back to re-examine them, that sense of magic in story comes	<p>b. Describe the beginning of storytelling traditions and how storytelling has evolved into the following visual media of today:</p> <ul style="list-style-type: none"> <li>• Film</li> <li>• Television</li> <li>• Art</li> <li>• Interactive entertainment (games)</li> <li>• Linear storytelling</li> <li>• Non-linear storytelling</li> <li>• Backstory</li> <li>• Theme</li> </ul>	<p>b. Group Participation Rubric</p> <p>Presentation Rubric</p>

<p>right back.” -Jed Smith (DOK1)</p>	<ul style="list-style-type: none"> <li>• Setting</li> <li>• Plot</li> <li>• PPOV-Player Point of View</li> <li>• Aesthetics <sup>CS8, T2</sup></li> </ul> <p>In groups, students will discuss how their favorite game is related to a story from history, literature, art, music, or film. Students will describe how the adaptation evoked the idea for the game.</p> <p>Students, in groups of four, will select a visual media outlet and present, using PowerPoint, how storytelling traditions evolved.</p>	
<p>c. Determine the steps in creating and editing a game design document. (DOK1)</p>	<p>c. Discuss the four phases of the design document writing process:</p> <ul style="list-style-type: none"> <li>• Target audience</li> <li>• Geographics</li> <li>• Demographics</li> <li>• Psychographics <sup>CS9, W4, T3, T4</sup></li> </ul> <p>Students will complete mind-mapping forms and story trees.</p>	<p>c. Participation Rubric</p>
<p>d. Demonstrate use of a traditional story structure <i>three-act</i> plot structure. (DOK1)</p>	<p>d. Explain the <i>three-act</i> structure used by Hollywood screenwriters to create a story based on an idea. <sup>CS8, E1, E2, W2, W4, W5</sup></p> <p>Three-Act Structure:</p> <ol style="list-style-type: none"> <li>1. Beginning (Act 1): Place the audience into the action or drama of the story. Introduce the problem.</li> <li>2. Middle (Act II): Focus on the obstacles that stand in the way of solving the problem.</li> <li>3. End (Act III): The problem introduced in Act I has been solved, and the obstacles have been removed.</li> </ol> <p>Students will create a short story based on the three-act concept.</p>	<p>d. Short Story Checklist</p>
<p>e. Demonstrate use of the <i>monomyth</i> story structure, aka “hero’s journey,” by Joseph Campbell. (DOK1)</p>	<p>e. Explain Joseph Campbell’s <i>monomyth</i> story structure with the 12 steps of Vogler to create a game story based on an idea. <sup>CS6, E1, E2, W2, W4, T1, T2, T3, T4, T5, T6</sup></p> <p>Vogler’s 12 steps:</p> <ul style="list-style-type: none"> <li>• Ordinary World: The hero’s ordinary world is established.</li> <li>• Call to Adventure: The quest or journey is introduced.</li> <li>• Refusal of the Call: The hero refuses but is uncomfortable with the decision.</li> <li>• Meeting with the Mentor: The hero receives information relevant to the quest and needs to go on the journey.</li> </ul>	<p>e. Monomyth Rubric</p>

	<ul style="list-style-type: none"> <li>• Crossing the First Threshold: The hero abandons the refusal and embarks on the journey.</li> <li>• Tests, Allies, and Enemies: The hero is tested and makes friends and enemies.</li> <li>• Approach to the Inmost Cave: The hero faces more tests and preparations</li> <li>• Ordeal: The hero must defeat the villain.</li> <li>• Reward: The hero gets the reward.</li> <li>• The Road Back: The hero has to choose the special world or ordinary world.</li> <li>• Resurrection: The hero must face death one more time.</li> <li>• Return with the Elixir: The hero finally returns but is changed forever.</li> </ul> <p>Students will develop a game's story using Campbell's <i>monomyth</i> story structure and the 12 steps of Vogler.</p>	
f. Understand story elements. "The experience of playing the game is really what allows the story to unfold." -Jeannie Novak (DOK1)	<p>f. Discuss the different story elements and how they relate to the storytelling devices. <sup>CS8, CS9, R1, R2, E1, E2, W2, W4, T2, T3</sup></p> <ul style="list-style-type: none"> <li>• Premise: The concept</li> <li>• Backstory: What leads up to where the game begins</li> <li>• Synopsis: Running story line</li> <li>• Theme: What the story is all about</li> <li>• Setting: The backdrop for the story</li> <li>• Plot: How the story unfolds <sup>CS9, R1, R2, T3</sup></li> </ul> <p>Students will select a video game of their choice. They should define the story elements of the game in a short report they are to write and submit for grading.</p>	f. Report Rubric
g. Understand storyboarding. (DOK1)	<p>g. Discuss storyboarding related to the initial phase of game design. <sup>CS8, CS9, R1, R2, E1, E2, W2, W4, T2, T3</sup></p> <p>Students will create a storyboard template to be used in Unit 4, Competency 3.</p>	g. Storyboard Rubric

**Competency 2: Understand the character creation process. (DOK1)** <sup>VGD.01, VGD.31, VGD.49</sup>

**Suggested Enduring Understandings**

1. It is important for students to learn how to create an identity for a game's character or characters. It is important to add a personal dimension to the player's experience.

**Suggested Essential Questions**

1. How are game characters different from characters in other media?
2. How does visual character development differ from other forms of character development in games?

Suggested Performance

Suggested Teaching Strategies

Suggested Assessment

Indicators		Strategies
a. Understand the elements of a character's identity. (DOK1)	a. Define terms related to character creation and character types: <ul style="list-style-type: none"> <li>• Avatar</li> <li>• Non-player characters (NPCs)</li> <li>• Animal</li> <li>• Fantasy</li> <li>• Historical</li> <li>• Licensed</li> <li>• Mythic</li> <li>• Hero</li> <li>• Shadow</li> <li>• Mentor</li> <li>• Allies</li> <li>• Guardian</li> <li>• Trickster</li> <li>• Herald</li> <li>• Protagonist</li> <li>• Antagonist</li> <li>• Co-protagonists</li> <li>• Supporting characters <small>CS7, CS9, R4, T3, T6</small></li> </ul> <p>Students will define the above terms and then, as a group, match each term with an existing character in a video game or movie.</p>	a. Group Participation Rubric
b. Discuss how tone, audience, and purpose impact character identity development. (DOK1)	b. Discuss player characters and non-player characters and how they are controlled by the player or controlled by artificial intelligence (AI). <small>CS8, CS9, E1, E2, W2, W4, T2, T3</small> <p>Students will define the characters of their story and how those characters address the Social Hierarchy of Needs (Maslow). Students will use PowerPoint to present their characters.</p>	b. Presentation Rubric
c. Discuss the design sequence rules and regulations for game design. (DOK1)	c. Watch <i>How Video Games Are Made</i> on Youtube.com, and discuss the proper design sequence ( <a href="http://www.youtube.com/watch?v=u0FoYgZmIMs">http://www.youtube.com/watch?v=u0FoYgZmIMs</a> ). <small>CS7, CS8, CS9, CS10, CS11, T2, T3, T4</small>	c. Participation Rubric

**Competency 3: Apply design principles and techniques in the creation of a 2-D, digital, and 3-D character. (DOK2)**  
 VGD.07, VGD.08, VGD.09

**Suggested Enduring Understandings**

1. It is important for students to learn artistic concepts in the creation and development of visual characters.
2. Having an understanding of 3-D and 2-D environments is a key component when developing a game environment.

**Suggested Essential Questions**

1. What are the considerations when assigning physical characteristics to game characters?
2. How do the visual features of a game character reflect the character’s personality related to facial expressions, gestures, poses, costume, and color?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Understand design principles and techniques for use in planning, designing, and producing a game character. (DOK1)	a. Explain design principles and techniques used in the following areas: <ul style="list-style-type: none"> <li>• Concept art</li> <li>• Modeling</li> <li>• Texturing</li> <li>• Animation</li> <li>• Movement</li> <li>• Appearance</li> <li>• 2-D</li> <li>• 3-D <small>CS6, CS7, CS8, CS9, CS10, CS11, T1, T2, T4</small></li> </ul>	a. Group Participation Rubric
	Working in groups, students will use the Internet to find examples of each of the principles or techniques and orally present those findings to the class.	
b. Describe sketching as an artistic concept. Explain the basic concepts of sketching as a tool for game design. (DOK1)	b. Discuss sketching and how it is the initial phase of game design. Demonstrate the use of art supplies. <small>CS6, CS9, T1</small>  Students will describe basic drawing supplies such as graphite pencils, sketch pad, and grids.  Students will use a pencil to sketch a wire drawing demonstrating the use of basic contouring.  Students will use a pencil to sketch a character of their choice creating several views to include front, sides, and back.  Students will work in groups to create a storyboard incorporating all the characters from the sketches.	b. Storyboard Rubric  Peer Evaluation Rubric  Group Participation Rubric
c. Demonstrate the use of digital drawing	c. Discuss the use of digital drawing tablets. <small>CS9, CS10, CS11, T6</small>	c. 2-D Digital Drawing Rubric

tablets as a 2-D digital artistic concept. (DOK2)	Students will use digital drawing tablets to render their sketched character.	Peer Evaluation Rubric
d. Understand 3-D. (DOK1)	d. Discuss the Cartesian coordinate system, using the x-, y-, and z-coordinates. Create a three-dimensional character using modeling clay. <sup>CS7, CS9, CS10, CS11, M1, M5, T4</sup>  Students will use modeling clay to create their game character and compare and contrast the finished product to the front, side, and back views of the original sketch.	d. Project Rubric  Observe to determine mastery of 3-D visualization.

**Competency 4: Understand the “rules of play” in game design technology. (DOK1)** <sup>VGD.07, VGD.08, VGD.09</sup>

**Suggested Enduring Understandings**

1. All games contain rules. The rules of play are called *gameplay*. The gameplay is a set of instructions for the player called gameplay mechanics. Gameplay mechanics are the *meat* of the design.

**Suggested Essential Questions**

1. What is the relationship between gameplay and game story?
2. Why is the experience of playing the game so important?
3. How should game rules be structured?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the relationship between gameplay and game story. (DOK1)	a. Discuss victory and loss conditions of a game. Choose a game, and determine what the “win” and “loss” conditions are in relation to gameplay. Are they different from the story? <sup>CS7, CS9, T4</sup>  Introduce students to interactivity modes: <ul style="list-style-type: none"> <li>• Player-to-Game</li> <li>• Player-to-Player</li> <li>• Player-to-Developer</li> <li>• Player-to-Platform <sup>CS9, CS10, CS11, T6</sup></li> </ul> Students will use the Internet to find one game example for each interactivity mode listed above then discuss those findings with the class.	a. Participation Rubric
b. Demonstrate use of “rules of play” in game design technology. (DOK2)	b. Allow students to use their original story ideas and characters and explain how their game would follow gameplay expectations. <sup>CS8, CS9, E1, E2, W2, W4, T2</sup>  Instruct students to write a one- to two-page reflection paper about the process of creating their character and writing the story, identifying areas for improvement for their game design process. Encourage students to reflect on how they employed design, character development, and technical skills they have learned in this project. Encourage students to reflect on what skills and techniques they want to learn next to further their knowledge of game design.	b. Peer Evaluation Rubric  Reflection Paper Rubric
c. Discuss the structure	c. Discuss balance of obstacles and aids and penalties	c. Group Participation

of game “rules.” (DOK1)	and rewards. <sup>CS8, CS9, CS10, T2, T6</sup>	Rubric
How should games be structured? How do you create balance within a game?	In groups, students will evaluate teacher-approved games for balance related to obstacles and aids, penalties and rewards, and the nature of “world” interaction.	

**Competency 5: Identify hardware and software related to the game design industry. (DOK1)** <sup>VGD.12, VGD.73</sup>

**Suggested Enduring Understandings**

1. There are basic hardware options available to game players, and there are also software options available for the game designers.

**Suggested Essential Questions**

1. How can students create games for different platforms?
2. What software enables students to create, design, and develop video games?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify standard hardware platforms available to game players. (DOK1)	<p>a. Identify available platforms. Include the following:<sup>CS9, T6</sup></p> <ul style="list-style-type: none"> <li>• Arcade</li> <li>• Consoles</li> <li>• Computer</li> <li>• Online</li> <li>• Handheld</li> <li>• Tabletop</li> </ul> <p>Using the Internet, research and generate a list of available hardware platforms available to game players. Include the manufacturer, make, and model. Students will discuss their findings with the class.</p>	<p>a. Grade the list.</p> <p>Participation Rubric</p>
b. Identify standard software examples for game design and development technology. (DOK1)	<p>b. Identify software that can be used to design and develop video games. Include animation software, photography software, imaging software, audio software, and game engines.<sup>CS9, CS10, CS11, CS12, T3, T6</sup></p> <p>Using the Internet, research and generate a list of available software for game designers and developers. Students will discuss their findings with the class.</p>	<p>b. Grade the list.</p> <p>Participation Rubric</p>



# Standards

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## **IGDA Standards**

- VG.D.01 Game Criticism
- VG.D.02 Media Studies
- VG.D.07 Conceptual Game Design
- VG.D.08 Serious Game Design
- VG.D.09 Practical Game Design
- VG.D.12 Information Design
- VG.D.31 Visual Asset Generation
- VG.D.49 Story in Non-Interactive Media
- VG.D.61 Design and Development Documentation
- VG.D.73 Game Industry Economics

## **21st Century Learning Standards**

- CS6 Creativity and Innovation
- CS7 Critical Thinking and Problem Solving
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy

## **National Educational Technology Standards for Students**

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- M1 Basic Operations and Applications
- M5 Graphical Representations
- R1 Main Ideas and Author's Approach
- R2 Supporting Details
- R4 Meaning of Words
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W4 Organizing Ideas
- W5 Using Language

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Participation Rubric

	<b>Beginning 1 point</b>	<b>Developing 2 points</b>	<b>Accomplished 3 points</b>	<b>Exemplary 4 points</b>	<b>Score</b>
<b>Group Discussions</b>	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
<b>On-Task Behavior</b>	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
<b>Helping Others</b>	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
<b>Listening</b>	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
<b>Total Score</b>					

**Comments:**

## Short Story Checklist

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- \_\_\_\_\_ The title is effective; it hints at the subject but acts as more than a label.
- \_\_\_\_\_ The story has a beginning that gets the reader's attention and makes him or her want to read more.
- \_\_\_\_\_ The setting is established early in the story and is essential to the story.
- \_\_\_\_\_ Characters are well developed and have realistic, complex problems.
- \_\_\_\_\_ The story is well organized. One idea or scene follows another in a logical sequence with clear transitions.
- \_\_\_\_\_ Dialogue is meaningful; it is used to move the plot along and/or tell the reader something about a character.
- \_\_\_\_\_ The plot identifies a conflict/problem that the main character faces.
- \_\_\_\_\_ The purpose of the story is clear; the plot and characters communicate a theme.
- \_\_\_\_\_ The ending is effective; it is clear how the main conflict will be solved.
- \_\_\_\_\_ Spelling is flawless.
- \_\_\_\_\_ Capitalization and punctuation rules are followed.
- \_\_\_\_\_ Verb tense is consistent.
- \_\_\_\_\_ Word choice is appropriate and effective.

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Storyboard Rubric

	<b>Excellent 4 points</b>	<b>Good 3 points</b>	<b>Satisfactory 2 points</b>	<b>Needs Improvement 1 point</b>	<b>Score</b>
<b>Content</b>	All content is in the student's own words and is accurate.	Almost all content is in the student's own words and is accurate.	At least half of the content is in the student's own words and is accurate.	Less than half of the content is in the student's own words and/or is accurate.	
<b>Required Elements</b>	Storyboard included all required elements.	Storyboard included most of the requirements but left out one or two.	Storyboard is missing a few requirements and is a bit incomplete.	Many required elements are missing. This storyboard is very incomplete.	
<b>Organization</b>	Storyboard is easy to read, and all elements are clearly written, labeled, or drawn.	Storyboard is easy to read, and most elements are clearly written, labeled, or drawn.	Storyboard is hard to read with rough drawings and labels.	Storyboard is hard to read, and one cannot tell what goes where.	
<b>Creativity</b>	Storyboard has plenty of pictures, diagrams, games, animations, buttons, or sounds to make it unique and refreshing.	Storyboard has some pictures, diagrams, games, animations, buttons, or sounds. It is somewhat unique.	Storyboard has few pictures, diagrams, games, animations, buttons, or sounds. It is a little on the boring side.	Storyboard has almost no pictures, diagrams, games, animations, buttons, or sounds. It is quite boring.	
<b>Total Score</b>					

## Unit 5: Photography for Game Design

**Competency 1:** Demonstrate proficiency in the setup, operation, and troubleshooting of a graphic design computer. (DOK1) VGD.05, VGD.12, VGD.26, VGD.29, VGD.31

### Suggested Enduring Understandings

1. Proficiency in the setup and maintenance of an operating system and application software is essential to understanding and avoiding future problems.

### Suggested Essential Questions

1. How do you know if you are having hardware or software problems?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Demonstrate proficiency in the setup and maintenance of a graphic computer system. (DOK1)	a. Use a multimedia presentation to discuss the setup and maintenance of a graphic computer system. <small>CS8, CS9, CS10, CS11, T2, T6</small>	a. Diagram Rubric
b. Manipulate a window by using application software functions and keyboard shortcuts. (DOK1)	b. Use presentation equipment to demonstrate window applications and keyboard shortcuts. <small>CS8, CS9, CS10, CS11, T2, T6</small>	b. Presentation Rubric
c. Demonstrate knowledge of an electronic file management system and folder management. (DOK1)	c. Use presentation equipment to demonstrate the operation of setting up files and folders. <small>CS8, CS9, CS10, CS11, T2, T6</small>	c. Presentation Rubric

**Competency 2:** Explain photography and graphic digital manipulation elements. (DOK1) VGD.26, VGD.29, VGD.31

### Suggested Enduring Understandings

1. Professional images are so perfect looking. How do I make my images look professional?

### Suggested Essential Questions

1. How are images analyzed?
2. How are images enhanced to make them look more professional?
3. How are imperfections in images corrected?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify safety and proper use of equipment related to photography. (DOK1)	<p>a. Discuss proper handling and safety rules when using a digital camera. Do training with students one-on-one to ensure that they understand how to handle the camera. <small>CS8, CS9, CS10, CS11, CS14, T2, T6</small></p> <p>Review the do's and don'ts of digital camera care: <small>CS8, CS9, CS10, CS11, T2, T6</small></p> <p><b>Do...</b></p> <ul style="list-style-type: none"> <li>• Regularly clean the camera.</li> <li>• Lens care: To take care of the lens, make sure</li> </ul>	a. Safety Checklist

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that you never, ever touch it directly with your fingers and that you put on the lens cap when not shooting pictures.

- Handle all moving parts of the camera with care.
- Turn off the camera before removing or disconnecting the power source or a cable or removing the battery or memory card.
- Keep your camera dry and free from condensation.
- Store your camera correctly if it is not going to be used for a long time.
  - When storing your digital camera, you need to keep it away from magnets of any form. Magnets will affect the circuitry of your digital camera and should not be placed near it.
  - Another point to note is to use silica gel to combat condensation. Many electronic products come with silica gel capsules. Keep these, and put them in your digital camera storage box. It will prevent condensation.
  - Batteries can have corrosive leaks over time. Therefore, the batteries of the camera should also be removed if you intend to store the camera away for a long time.
  - Store your digital camera in a **cool, dry place** away from windows, furnaces, and damp basements.

***Don't...***

- Subject your camera to knocks, vibration, magnetic fields, smoke, water, steam, sand, or chemicals.
- Store or use your camera in humid, dusty, or dirty places.
- Subject your camera to extreme hot or cold temperatures.
- Place your camera in direct sunlight for prolonged times or in a car when it is hot.
- Scratch the camera with hard or sharp objects.
- Drop your camera in water. It may be damaged beyond repair.
- Use canned air. Most consumer digital cameras are not airtight, and canned air may blow dust into the inside of the lens.

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b. Identify the basic components of a digital camera and photography-related

b. Show students the different parts of a digital camera, and allow for discussion on how cameras are similar and how they are different. CS8, CS9, CS10, CS11, CS14, T2, T6

b. Give a written test to assess DOK for terms, phrases, and functions as they

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terms. (DOK1)	Vocabulary terms may include the following:	pertain to the given competency.
	<ul style="list-style-type: none"> <li>• Shutter release</li> <li>• Program settings</li> <li>• Battery compartment</li> <li>• Zoom ring</li> <li>• Focusing ring</li> <li>• Focal length</li> <li>• Aperture</li> <li>• Shutter speed</li> <li>• ISO rating</li> <li>• Framing</li> <li>• Emphasis</li> <li>• Angle of view</li> <li>• Balance</li> <li>• Rule of thirds</li> <li>• Close-ups</li> <li>• Tone and sharpness</li> <li>• Arrangement</li> <li>• Portrait</li> <li>• Landscape</li> <li>• Lens</li> <li>• Zoom lens</li> <li>• Depth of field</li> <li>• Autofocus</li> <li>• Resolution</li> <li>• Pixel</li> <li>• Megapixel</li> <li>• White balance</li> <li>• Camera body</li> <li>• LCD display</li> <li>• Viewfinder</li> <li>• Memory card</li> <li>• SD card</li> <li>• Flash (camera flash)</li> <li>• Filter</li> <li>• Tripod</li> <li>• Batteries</li> <li>• File compression</li> <li>• Macro</li> <li>• Aperture</li> <li>• Shutter speed</li> <li>• ISO rating <sup>CS7, CS9, T3, T6</sup></li> </ul>	Camera Parts Checklist

**Competency 3: Complete a photography project that meets the needs of an audience. (DOK2)** VGD.26, VGD.29, VGD.31

<b>Suggested Enduring Understandings</b>	<b>Suggested Essential Questions</b>
<ol style="list-style-type: none"> <li>1. It is important to know how to take photographs that are professional in their composition and meet the needs of the client.</li> </ol>	<ol style="list-style-type: none"> <li>1. What techniques do professional photographers use?</li> <li>2. How are computers used to make professional photographs and pictures?</li> </ol>

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Explore image composition and elements of visual design through photography. (DOK1)	a. Have students download their images and compare them to your examples. Use this comparison to continue the discussion of image composition. <sup>CS8, CS9, CS10, CS11, CS14, T2, T6</sup>	a. Compare and Contrast Chart Rubric
b. Distinguish file type per job needed. (DOK1)	<p>b. Incorporate a variety of image files types into a collage of images. <sup>CS9, CS10, CS11, T2, T6</sup></p> <p>Discuss with students the differences file types make in relation to storage (i.e., file card, media card, and selection). <sup>CS8, CS9, CS10, CS11, T2, T6</sup></p> <p>Discuss with students the different applications, advantages, and disadvantages of saving files in the various formats. <sup>CS8, CS9, CS10, CS11, T2, T6</sup></p> <p>File types may include the following:</p> <ul style="list-style-type: none"> <li>• Raw</li> <li>• Jpeg (two types)</li> <li>• Gif</li> <li>• Tiff</li> <li>• Bitmap</li> <li>• PDF</li> <li>• PSD</li> </ul>	<p>b. Give a written test.</p> <p>Teacher observation</p> <p>Give students scenarios to determine which file format would be the best suited for the application.</p>
c. Use digital cameras to learn the basics of photography. (DOK1)	c. Illustrate basic digital camera skills such as how to operate the camera and save and download files. <sup>CS8, CS9, CS10, CS11, T2, T6</sup>	c. Camera Skills Rubric
d. Identify and produce portrait photographs, art photographs (objects in the classroom), and landscape photographs. (DOK2)	d. Have students experiment with taking portrait photographs, art photographs, and landscape photographs. Lead an open discussion among the students relative to the different elements and applications of the different types of photos. <sup>CS8, CS9, CS10, CS11, T2, T6</sup>	d. Have students observe examples of portrait, art, and landscape photos. Students will determine photo type and note it on an answer sheet to be submitted for grading.
e. Use photo manipulation to investigate the potential of color enhancement and retouching. (DOK2)	<p>e. Instruct students to retake their photographs, trying to improve on their initial efforts by applying their knowledge of image composition and elements of visual design. <sup>CS8, CS9, CS10, CS11, T2, T6</sup></p> <p>Viewing the photograph via photo enhancing software, let them experiment on photo enhancing software and determine the most satisfactory image according to brightness, contrast, and color.</p>	e. Image Composition Checklist
f. Compare and contrast the advantages of manipulating a saved	f. Translate the “I do, we do, you do” method. <sup>CS8, CS9, CS10, CS11, T2, T6</sup>	f. Have students save manipulated photos to a student folder

copy of an image in various formats. (DOK2)

for grading.

**Competency 4:** Use photo editing software to create and edit a product for a customer. (DOK2) VG.D.26, VG.D.29, VG.D.31

**Suggested Enduring Understandings**

1. Photo editing software can be a powerful business tool when used appropriately.

**Suggested Essential Questions**

1. What types of software are available to enhance images?
2. How can I combine digital camera effects with the photo editing software most effectively in order to achieve my client's needs?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify terminology related to the photo editing software. (DOK1)	a. Have students perform the activities outlined in the <i>Adobe Photoshop CS4 Classroom in a Book</i> excerpt "Getting to Know the Work Area." <small>CS8, CS9, CS10, CS11, CS14, CS15, T2, T3, T6</small>  Terms may include the following: <ul style="list-style-type: none"> <li>• Layers</li> <li>• Mask</li> <li>• Filters</li> <li>• Sharpening</li> <li>• Noise</li> <li>• Toolbox tools selection</li> <li>• Cloning <small>CS7, CS9, T3, T6</small></li> </ul>	a. Collage Rubric
b. Demonstrate how to open and save an image from a digital camera and an image from a scanner in photo editing software. (DOK1)	b. Students will perform the activities outlined in "Adobe Guide: How to Scan Images." <small>CS8, CS9, CS10, CS11, CS14, CS15, T2, T3, T6</small>	b. Peer Evaluation Rubric
c. Apply the following tools of photo editing software: (DOK2) <ul style="list-style-type: none"> <li>• Histogram</li> <li>• Levels</li> <li>• Curves</li> <li>• Brightness</li> <li>• Auto color correction</li> <li>• Clone stamp</li> <li>• Lasso</li> <li>• Magic wand</li> <li>• Crop</li> <li>• Image</li> <li>• Canvas size</li> </ul>	c. Discuss and demonstrate the following techniques to help students make their pictures the best they can be for their collages: <small>CS8, CS9, CS10, CS11, CS14, CS15, T2, T3, T6</small> <ul style="list-style-type: none"> <li>• Assessing color: Use the histogram to determine whether to use the levels, curves, and brightness sliders to adjust color in a photograph.</li> <li>• Adjusting color: Use the auto color-correction tools.</li> <li>• Retouching: Use the Clone Stamp to remove unwanted elements, use the Spot Healing Brush to touch up small areas, or use the Red Eye tool to remove red eye.</li> <li>• Selecting: Use selection tools such as the Lasso</li> </ul>	c. Give a written test.

- Transform

and Magic Wand tools to correct a blemish, or use selection tools to select a certain element of an image to copy and paste into a collage.

- Cropping and straightening: Use the Crop tool to remove unwanted elements of a photograph.
- Resizing: Use the Image and Canvas Size tools to adjust the size of the image.
- Resolution: Use Resolution Check to prepare the collage for printing on the designated size of paper (minimum for printing for 8-in. by 10-in. is 1,600 x 1,200 pixels).
- Experimenting: Experiment and keep track of your changes by using the History palette, and remove unwanted steps with the Undo palette.
- Merging photos: Use Photomerge to create panoramic images.
- Transforming photos: Use Transform tools to scale, rotate, or skew a selection.

**Note:** Emphasize to students the importance of using editing and manipulation tools thoughtfully so they do not change the original intent of the photographs. Explain that being able to make changes means they should be careful about what they are creating.

d. Determine proper resolution for incorporating an image in visual design software. (DOK2)	d. Utilizing the “I do, we do, you do” method, first demonstrate the process of determining proper resolution of a specific photo for a given format; next, work through the process along with the students; finally, have them repeat the process on their own. <small>CS8, CS9, CS10, CS11, CS14, CS15, T2, T3, T6</small>	d. Have students save an image to a student folder on the desktop or network drive. The teacher will evaluate for accuracy.
e. Use Photomerge to create panoramic images. (DOK2)	e. Demonstrate the process of stringing photos together. <small>CS8, CS9, CS10, CS11, T2, T6</small>	e. Have students string together a minimum of three photos into a panorama. Evaluate for accuracy and appearance.

# Standards

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## **IGDA Standards**

- VG.D.05 Experience of Play
- VG.D.12 Information Design
- VG.D.26 Basic Visual Design
- VG.D.29 Visual Narratives: Painting, Comics, Photography, Film
- VG.D.31 Visual Asset Generation

## **21st Century Learning Standards**

- CS7 Critical Thinking and Problem Solving
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy
- CS14 Social and Cross-Cultural Skills
- CS15 Productivity and Accountability

## **National Educational Technology Standards for Students**

- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T6 Technology Operations and Concepts

## References

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Adobe Systems, Inc. (2008). *Adobe design center*. Retrieved September 15, 2008, from <http://www.adobe.com/products/tips/photoshop.html>

Adobe Systems, Inc. (2008). *Visual design: Foundations of design and print production*. Retrieved November 21, 2008, from <http://www.adobe.com/education/instruction/teach/visualdesign.html>

Kodak. (n.d.). *Tips and projects center*. Retrieved September 15, 2005, from [http://www.kodak.com/eknec/PageQuerier.jhtml?pq-path=2/3/38&pq-locale=en\\_US](http://www.kodak.com/eknec/PageQuerier.jhtml?pq-path=2/3/38&pq-locale=en_US)

Mundi Design Studios. (2001). *Mundi design studios*. Retrieved September 15, 2005, from <http://www.studiomundi.com>.

For additional references, activities, and Web resources, please refer to the Game Design and Development Technology P.A.C.E. Web site at <http://www.rcu.blackboard.com> (available only to registered users).

## Suggested Rubrics and Checklists

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# Design Visualization and Character Development

## Unit 6: Artistic Rendering Using Illustration Software

**Competency 1:** Understand the elements of visual design in relation to game design. (DOK1) <sup>VGD.26</sup>

### Suggested Enduring Understandings

1. Students should learn the visual elements related to game design and development and describe the difference between low-resolution and high-resolution effects.
2. Students should be exposed to the differences in the varying color models available.

### Suggested Essential Questions

1. What are the visual elements associated with video game design?
2. What are the basic elements of an image?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the visual elements that make up a video game. (DOK1)	a. Identify the visual aspects of games to include the following terminology: <ul style="list-style-type: none"> <li>• Graphics</li> <li>• Sprites</li> <li>• Pictures</li> <li>• Illustrations</li> <li>• Images</li> <li>• Menu screens</li> <li>• Credit screens</li> <li>• Logos for companies, products, and services</li> <li>• User interfaces</li> <li>• In-game assets <sup>CS9, CS10, CS11, T3, T6</sup></li> </ul>	a. Grade terms.
b. Discuss the basic elements of an image. (DOK1)	b. Describe pixels, and explain the difference between low-resolution and high-resolution graphics as related to game design. <sup>CS8, CS9, CS10, CS11, T2, T6</sup>  Students will identify the resolution of the computers in the classroom and explore how this can be changed and/or adjusted for graphic resolution.  Students will illustrate the difference between low and high resolution by downloading examples from the Internet and increasing the size to see if there are any changes in the pixilation. Students will print and present their examples to the class.	b. Presentation Rubric
c. Discuss the element of color and number of colors related to game design. (DOK1)	c. Describe the use of color and its RGB value and CMYK value. Explain color depth and how it is defined by the number of colors. <sup>CS8, CS9, CS10, CS11, T2, T6</sup>  Students will access the color wheel using illustration software and manipulate the colors of	c. Peer Evaluation Rubric



	an image.	
d. Demonstrate the manipulation of images with the use of software commands. (DOK2)	d. Using illustration software, students will manipulate images using cut, copy, paste, skew, rotate, crop, and vertical and horizontal flips. <sup>CS6, CS8, CS9, CS10, CS11, CS12, T1, T6</sup>	d. Graded poster
	Students will create a poster that demonstrates manipulation of images.	

**Competency 2: Demonstrate the use of illustration software. (DOK2)** <sup>VGD.31, VGD.35</sup>

**Suggested Enduring Understandings**

1. It is important for students to learn how to navigate the workspace, user interface, and multiple art boards using illustration software.
2. Students should be able to differentiate between varying image types and their proper uses in developing games.

**Suggested Essential Questions**

1. What are some of the uses of illustration software?
2. Who uses illustration software?
3. What is the difference between a scratchboard and an artboard?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Understand the elements of the illustration software user interface. (DOK1)	a. Define terms related to the key user interface elements: <ul style="list-style-type: none"> <li>• GUI</li> <li>• Interface</li> <li>• Workspace</li> <li>• Scratchboard</li> <li>• Artboard</li> <li>• Layers</li> <li>• Opacity</li> <li>• Menu bar</li> <li>• Application bar</li> <li>• Toolbox</li> <li>• Control panel</li> <li>• Docks</li> <li>• Precise cursor</li> <li>• Shape</li> <li>• Geometric shape</li> <li>• Freeform</li> <li>• Precision drawing</li> <li>• Gradient</li> <li>• Value</li> <li>• Texture <sup>CS7, CS9, R4, T3, T6</sup></li> </ul>	a. Test students on illustration software terms.
b. Explore and discuss the tools, features, and preferences within the illustration software. (DOK1)	b. Demonstrate opening the illustration software and navigating the user interface. <sup>CS8, CS9, CS10, CS11, CS12, T6</sup>  Students will open the illustration software and navigate the user interface by opening, importing, and exporting sketches.  Demonstrate how to set up personal	b. Teacher observation  Grade list of preferences for correct terminology.

		preferences within the illustration software. CS8, CS9, CS10, CS11, CS12, T6	
		Students will set up their personal preferences in the illustration software and create a written list.	
c. Understand the two types of digital images—bitmap and vector—and learn the common image format types. (DOK1)	c. Define bitmap and vector images, and discuss the uses for each. CS8, CS9, CS10, CS11, CS12, T6	Students will import and manipulate bitmap and vector images. Students will save and export bitmap and vector images.	c. Graded images
d. Differentiate between the use of value and texture in illustrative art. (DOK1)	d. Discuss the use and modification of illustration tools. Demonstrate the steps for creating and applying patterns. CS8, CS9, CS10, CS11, CS12, T6	Students will add value and texture to sketched images.	d. Illustration Rubric
e. Explore spatial illusions using illustration software. (DOK1)	e. Demonstrate the illusion of dimensionality with illustration software. CS8, CS9, CS10, CS11, CS12, T6	Students will apply reshaping tools to produce dimensional impact on images.	e. Illustration Rubric
f. Demonstrate mastery of illustration software. (DOK3)	f. Explain the requirements for an illustration project. CS8, CS9, CS10, CS11, CS12, T3, T6	Students will create, manipulate, and give dimensionality to an original image.	f. Illustration Rubric
g. Save and export completed image(s) into design visualization software. (DOK2)	g. Demonstrate how to save and export images into design visualization software. CS8, CS9, CS10, CS11, CS12, T6	Students will save and export created image(s) into the design visualization software.	g. Teacher observation

# Standards

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## **IGDA Standards**

- VG.D.26 Basic Visual Design
- VG.D.31 Visual Asset Generation
- VG.D.35 Game Art

## **21st Century Learning Standards**

- CS6 Creativity and Innovation
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy
- CS12 Flexibility and Adaptability

## **National Educational Technology Standards for Students**

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- R4 Meaning of Words

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Illustration Rubric

	<b>Does Not Meet Expectations 0 Points</b>	<b>Meets Expectations 3 Points</b>	<b>Exceeds Expectations 5 Points</b>	<b>Score</b>
<b>Illustration/Image</b>	Absent or incomplete	The illustration/image is original and employs design principles and uses such techniques as color, value and texture, and grouping.	The illustration/image is well planned and well sketched. The illustration/image is original; employs design principles; and uses such techniques as color, value and texture, and grouping. The illustration/image masters the use and modifications of tools and uses blending, distortion, molding, and gradients to produce spatial illusion.	
<b>On-Task Behavior</b>	Absent or incomplete	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
<b>Time Management</b>	Absent, incomplete, or unfocused	Student allots time for each phase of the design and development process. Completes most phases on schedule	Student thoughtfully and effectively allots time for each phase of the design and development process. Completes all phases on schedule	
<b>Listening</b>	Ignored discussion from instructor	Occasionally listened to discussion from instructor	Always listened to discussion from instructor	

## Unit 7: Design Visualization Software Introduction

**Competency 1:** Interact with the design visualization software effectively and productively with the user interface (UI). (DOK2) <sup>VG.D.11, VGD.12</sup>

### Suggested Enduring Understandings

1. Students should learn how to interact with design visualization software within the user interface (UI).
2. The ability to manipulate objects within illustration software is a key component to building a visually appealing game.

### Suggested Essential Questions

1. What are the key UI components associated with design visualization application software?
2. How can objects be manipulated with the design visualization application software?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Demonstrate the use of UI components in the design interface. (DOK2)	a. Discuss the graphical user interface (GUI) and how it works with the input devices. <sup>CS8, CS9, CS10, CS11, CS12, T6</sup>  Students will start the design visualization application software and interact with the GUI.	a. Teacher observation
b. Demonstrate the manipulation and configuration of the viewports. (DOK2)	b. Discuss the viewports, toolbars, command panels, menus, and frames. <sup>CS8, CS9, CS10, CS11, CS12, T6</sup>  Students will change the size and perspectives of the viewport.	b. Participation Rubric
c. Demonstrate the use of menus, toolbars, and command panels in relation to creating and manipulating objects. (DOK2)	c. Discuss the options available in the menus, toolbars, and command panels. Discuss orthographic views and manipulation. <sup>CS8, CS9, CS10, CS11, CS12, T6</sup>  Students will open and explore the menus, toolbars, and command panels.	c. Participation Rubric
d. Demonstrate the use of dialog boxes, controls, and keyboard shortcuts. (DOK2)	d. Discuss the manipulation of objects and models through the perspective viewport, click and drag features, and the steering wheel. <sup>CS8, CS9, CS10, CS11, CS12, T6</sup>  Students will manipulate objects and models in the perspective viewport; they will use the click and drag features and the steering wheel. Students will take screenshots of the viewports and place them in PowerPoint and present them to the class.	d. <b>Presentation Rubric</b>

**Competency 2:** Manage design visualization software file input and output. (DOK2) <sup>VG.D.11, VGD.12</sup>

### Suggested Enduring Understandings

1. It is important for students to learn how to begin a project, save a project, merge files, import and export files, and link files using visualization software.

### Suggested Essential Questions

1. What is the difference between beginning a new project and opening an existing project?

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|--|---|
| 2. Dimensioning of objects to create spatial illusions is a technique game designers need to provide for a sense of depth within the gaming environment. | 2. What is the difference between saving a file and using save as?<br>3. Why are extensions important when importing and exporting files? |
|--|---|

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Demonstrate starting a new project and working on an existing project. (DOK2)	<p>a. Discuss launching the visualization application software.<sup>CS8, CS9, CS10, CS11, CS12, T6</sup></p> <p>Students will start the design visualization application software and begin a new project.</p> <p>Students will open an existing project, take a screenshot, and place it in a Word document.</p>	a. Graded screenshot
b. Demonstrate saving a project for the first time and subsequent times. (DOK2)	<p>b. Discuss the use of Save and Save As commands.<sup>CS8, CS9, CS10, CS11, CS12, T6</sup></p> <p>Students will make some minor changes, save a project with a new name, save over an existing file, and place a screenshot in a Word document.</p>	b. Graded screenshot
c. Demonstrate the merging of files. (DOK2)	<p>c. Discuss the process of merging two existing files.<sup>CS8, CS9, CS10, CS11, CS12, T6</sup></p> <p>Within the visualization software, students will merge two existing files.</p>	c. Teacher observation
d. Demonstrate the importing and exporting of files. (DOK2)	<p>d. Discuss the import/export feature of the design visualization application software.<sup>CS8, CS9, CS10, CS11, CS12, T6</sup></p> <p>Students will import and export files and place a screenshot of the final product in a Word document.</p>	d. Import/Export Checklist
e. Demonstrate the linking and attaching of files. (DOK2)	<p>e. Discuss the file linking and attaching process.<sup>CS8, CS9, CS10, CS11, CS12, T6</sup></p> <p>Students will link and attach files.</p>	e. Teacher observation Participation Rubric
f. Explore spatial illusions using illustration software. (DOK2)	<p>f. Demonstrate the illusion of dimensionality with illustration software.<sup>CS8, CS9, CS10, CS11, CS12, T6</sup></p> <p>Students will apply reshaping tools to produce dimensional impact on images and print out the images.</p>	f. Peer Evaluation Rubric



# Standards

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## **IGDA Standards**

VG.D.11 Style and Design Principles

VG.D.12 Information Design

## **21st Century Learning Standards**

CS8 Communication and Collaboration

CS9 Information Literacy

CS10 Media Literacy

CS11 ICT Literacy

CS12 Flexibility and Adaptability

## **National Educational Technology Standards for Students**

T6 Technology Operations and Concepts

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

## Suggested Rubrics and Checklists

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## Unit 8: Geometry in Design Visualization Software

**Competency 1:** Set an environment for working with design visualization software, and create objects using basic geometry. (DOK1) <sup>VGD.31</sup>

### Suggested Enduring Understandings

1. Students should learn how to create objects using geometry, object selection, and object organization.
2. Students will understand the importance of transforming objects to fit the desired gaming environment.

### Suggested Essential Questions

1. What are the basic concepts of object creation and manipulation?
2. What are setup preferences, and how should they be managed?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the basic concepts of object creation and manipulation using basic geometry. (DOK1)	<p>a. Explain the concepts associated with object creation and manipulation using geometry. <sup>CS7, M5, M6, M7, T4, T6</sup></p> <p>Students will identify the basic concepts of object creation and manipulation within the user interface.</p>	a. Teacher observation for accuracy
b. Discuss the options for setting preferences and tool options in the user interface in relation to artists and designers. (DOK1)	<p>b. Explain how the options for setting preference and tool options in the user interface benefit the artists and designers. <sup>CS8, CS9, CS10, CS11, CS12, T6</sup></p> <p>Students will identify the Initial Settings dialog box and user interface schemes on the user interface. Students will open a created scene and set individual preferences and tool options and explain how they change or enhance the user interface and the scene.</p>	b. Participation Rubric
c. Use simple geometry and pivot points in relation to design visualization software. (DOK2)	<p>c. Explain how to use simple geometry and pivot points. <sup>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, T6</sup></p> <p>Students will demonstrate simple geometry creation and pivot points in relation to pivot point orientation and construction planes.</p> <p>Students will create cylinders in the top, front, and left viewports and explain how each object is transformed using pivot point orientation and construction planes. Students will use the screenshot option to paste into a Word document and then submit for a grade.</p>	c. Cylinder Checklist
d. Manipulate dialog boxes, controls, and keyboard shortcuts. (DOK2)	<p>d. Discuss the manipulation of objects and models through the perspective viewport, click and drag features, and the steering wheel. <sup>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, E1, E2, W1, W2, W3, W4, T6</sup></p>	<p>d. Object Checklist</p> <p>Journal Rubric</p>

	<p>Students will manipulate objects and models in the perspective viewport and use the click and drag features and the steering wheel by opening a created scene and manipulating the dialog boxes, controls, and keyboard shortcuts. Students will take a screenshot of the new version, paste it into a Word document, and then submit it for a grade.</p> <p>Students will create a reflective journal article that will explain the user interface manipulation, object creation, preferences, tool options, and pivot points. The article will include a review of the steps that were taken and how the objects and/or scenes were changed.</p>	
e. Transform objects using the basic transform commands. (DOK2)	<p>e. Discuss basic transform commands and gizmos available in the visualization application software. <small>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, T6</small></p> <p>Students will demonstrate the use of transform tools including the following by creating a simple transform in a created scene:</p> <ul style="list-style-type: none"> <li>• Move</li> <li>• Move transform gizmo</li> <li>• Move transform type-in</li> <li>• Rotate</li> <li>• Rotate transform gizmo</li> <li>• Rotate transform type-in</li> <li>• Scale</li> <li>• Scale transform gizmo</li> <li>• Scale transform type-in</li> <li>• Coordinate systems</li> <li>• Snaps</li> </ul> <p>Students will take before and after screenshots and compare the two, listing the changes in the viewport.</p>	e. Peer Evaluation Rubric
f. Demonstrate the use of align tools. (DOK2)	<p>f. Discuss the use of align tools. <small>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, T6</small></p> <p>Students will demonstrate the use of the align tools by ordering the layout of pictures based on the following:</p> <ul style="list-style-type: none"> <li>• Align XYZ position</li> <li>• Align orientation</li> <li>• Quick align</li> </ul> <p>Students will print out the final picture layout and then submit for a grade.</p>	f. Align Tools Checklist
g. Demonstrate the making of duplicate objects (cloning).	<p>g. Discuss the process of making duplicate objects using the following:</p> <ul style="list-style-type: none"> <li>• Cloning</li> </ul>	g. Duplicate Object Checklist

(DOK2)	<ul style="list-style-type: none"> <li>• Copy</li> <li>• Instance</li> <li>• Reference</li> <li>• Make unique</li> </ul> <p>Students will add legs to a chair and make adjustments to the backrest by using the cloning technique. Students will print the final object and then submit for a grade.</p>	
<p>h. Demonstrate object modification by manipulating basic controls in the stack. (DOK2)</p>	<p>h. Discuss the basic concepts of the modifier stack and how a series of changes takes place in design visualization software. <small>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, T6</small></p> <p>Students will demonstrate the use of the modifier stack by creating primitive objects and changing the parameters of each. Modifier examples include the following:</p> <ul style="list-style-type: none"> <li>• Bend</li> <li>• Taper</li> <li>• Noise</li> <li>• Twist</li> <li>• Shell</li> <li>• Lattice</li> <li>• FFD (Free Form Deformation)</li> <li>• Normal</li> </ul> <p>Students will take screenshots of each object before and after the manipulation. Students will paste the screenshots into a Word document and then submit for a grade.</p>	<p>h. Object Modification Checklist</p>
<p>i. Demonstrate collapsing the stack. (DOK2)</p>	<p>i. Discuss the base object types and how they relate to collapsing the stack. Emphasize that collapsing the stack should only be done when no more modifications are to be done. Terms include the following: <small>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, T6</small></p> <ul style="list-style-type: none"> <li>• Editable mesh</li> <li>• Editable spline</li> <li>• Editable poly</li> <li>• Editable patch</li> <li>• NURBS</li> </ul> <p>Students will demonstrate collapsing the stack to simplify an object. Students will create the primitive objects, modify the parameters, and collapse the stack making it a base object type. Have students explain that collapsing the stack removes the ability to control the object through its base and modifiers' parameters.</p>	<p>i. Teacher observation</p> <p>Collapsing Object Checklist</p>

**Competency 2: Design, create, and analyze the visual component of games. (DOK2)** VGD.26, VGD.31

**Suggested Enduring Understandings**

1. Students should learn how to create more complex 3-D geometrical objects and splines with modifiers.
2. Students will understand the role of Boolean operations and why they are so important to the game design process.

**Suggested Essential Questions**

1. What are the basic tools specific to the Architecture, Engineering, and Construction (AEC) industry in design visualization software?
2. What are Boolean operations, and why are they important in design visualization software?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Demonstrate the use of basic AES tools in relation to design visualization software. (DOK1)</p>	<p>a. Discuss and demonstrate basic concepts of object creation and manipulation within the user interface. <small>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, T6</small></p> <p>Working in groups, students will use the Object Creation Checklist to identify the basic object creation and manipulation tools within the user interface.</p>	<p>a. Group Participation Rubric</p> <p>Object Creation Checklist</p>
<p>b. Distinguish between the basic elements of a shape through modeling. (DOK1)</p>	<p>b. Discuss basic shape creation through modeling, and explain the editing process to include segment editing, vertex editing, fillet and chamfer, and lofts. <small>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, T6</small></p> <p>Students will create a profile of a bottle and use the lathe modifier.</p>	<p>b. Modeling Checklist</p>
<p>c. Discuss Boolean operations. (DOK1)</p>	<p>c. Explain Boolean operations and why they are important in design visualization software. <small>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, T6</small></p> <p>Students will identify Boolean operations to include subtraction, intersection, union, and merge by changing an object's volume, finding the common area to two objects and merging them, creating a union of two objects, and merging common edges and faces.</p> <p>Students will print the final version of the objects.</p>	<p>c. Boolean Checklist</p>
<p>d. Demonstrate geometry concepts through Boolean and pro-Boolean operations in design visualization software. (DOK2)</p>	<p>d. Review geometry using design visualization software, and discuss all the creative possibilities in object creation, object transformation, object modification, and modeling. <small>CS8, CS9, CS10, CS11, CS12, M5, M6, M7, T6</small></p> <p>Students will identify pro-Boolean operations to include operands that modify and edit shapes and splines.</p> <p>Students will create the shell of a building using</p>	<p>d. Geometry Concepts Rubric</p>

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Boolean and pro-Boolean tools.

Students will print the final version of the  
gasoline station.

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# Standards

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## **IGDA Industry Standards**

VG.D.26 Basic Visual Design

VG.D.31 Visual Asset Generation

## **21st Century Learning Standards**

CS7 Critical Thinking and Problem Solving

CS8 Communication and Collaboration

CS9 Information Literacy

CS10 Media Literacy

CS11 ICT Literacy

CS12 Flexibility and Adaptability

## **National Educational Technology Standards for Students**

T4 Critical Thinking, Problem Solving, and Decision Making

T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

E1 Topic Development in Terms of Purpose and Focus

E2 Organization, Unity, and Coherence

M5 Graphical Representations

M6 Properties of Plane Figures

M7 Measurement

W1 Expressing Judgments

W2 Focusing on the Topic

W3 Developing a Position

W4 Organizing Ideas

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

## Suggested Rubrics and Checklists

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## Unit 9: World Design Using Design Visualization Software

**Competency 1:** Identify the fundamental architectural and structural principles of level design in relation to game environments. (DOK1) <sup>VGD.33</sup>

### Suggested Enduring Understandings

1. The relationship between level design and gameplay is an important concept in game design.
2. The importance of architectural and visual features of the game environment can impact the gamer’s experience during play.

### Suggested Essential Questions

1. What is level design, and how is it related to gameplay?
2. What is the importance of the structural features of game worlds?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the history of architecture and how it relates to realistic game environments. (DOK1)	<p>a. Introduce students to architecture, its origination, and its evolution. Compare the fundamentals of architecture to the structural environments found in video game worlds. <sup>CS1, CS9, CS10, CS11, CS12, CS13, CS14, CS15, CS16, T3</sup></p> <p>Students will define the following terms in relation to creating game environments:</p> <ul style="list-style-type: none"> <li>• Level design</li> <li>• Game flow</li> <li>• Game duration</li> <li>• Campaign (missions)</li> <li>• Progression</li> <li>• Linear</li> <li>• Flat</li> <li>• S-curve</li> <li>• Game time</li> <li>• Authentic time</li> <li>• Limited time</li> <li>• Variable time</li> <li>• Player-adjusted time</li> <li>• Altered time</li> <li>• Space</li> <li>• Perspective <sup>CS7, CS9, R4, T3, T6</sup></li> </ul> <p>Students will define the terms.</p>	a. Written test to assess knowledge of terms
b. Discuss the relationship of level design and gameplay—what events occur in each level. (DOK1)	<p>b. Discuss how the basic structure and construction of the game world is divided into different sections (levels) and the impact on the game player. <sup>CS8, CS9, CS10, CS11, E1, E2, W1, W2, W4, T1, T2, T3, T4, T5, T6</sup></p> <p>Students will open an already constructed scene and view it from different angles and perspectives. They will create an essay that identifies the architectural features of each</p>	b. Essay Rubric

	object and how each may affect gameplay.	
c. Demonstrate the similarities and differences between real-world spaces and game spaces. (DOK2)	c. Provide the students with examples of real-world spaces and game spaces, and demonstrate the differences and similarities. <small>CS9, CS10, CS11, T3, T6</small>	c. Graded list
	Students will list the similarities and differences in a real-world space like outside the classroom window and the scene that was created with design visualization software.	
	Students will apply different lighting techniques to the created scene making adjustments for day and night.	

**Competency 2: Create, manipulate, and analyze the visual components of the game world. (DOK2)** VGD.31, VGD.33

**Suggested Enduring Understandings**

1. It is important for students to learn how to create, edit, and apply materials using mapping coordinates, modifiers, and textures using design visualization software.
2. The use of layers and texture maps plays an important role in the development of any gaming environment.

**Suggested Essential Questions**

1. How are reality and style achieved in a game environment?
2. How do mapping coordinates work?
3. How are materials applied using design visualization software?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify and manipulate mapping coordinates. (DOK1)	a. Discuss terrain and materials, mapping coordinates, and game authenticity. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small>	a. Written test to assess knowledge of terms
	Students will define the following terms related to materials and mapping: <ul style="list-style-type: none"> <li>• Materials</li> <li>• Radiosity</li> <li>• Special effects</li> <li>• Realism</li> <li>• Imagination</li> <li>• World surfaces</li> <li>• Scale</li> <li>• Boundaries</li> <li>• Tile</li> <li>• Style</li> <li>• Illusion</li> <li>• Hyper-reality <small>CS7, CS9, R4, T3, T6</small></li> </ul>	
b. Demonstrate how mapping coordinates work and how to manipulate those coordinates using modifiers in the design visualization software. (DOK2)	b. Discuss the use of mapping coordinates and their manipulation using design visualization software. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small>	b. Coordinate Checklist
	Students will create and adjust mapping coordinates within a scene in the design visualization software.	
c. Demonstrate the creation of	c. Discuss the process of creating basic materials	c. Presentation Rubric

<p>basic materials and the assignment of those materials to objects in a game scene. (DOK2)</p>	<p>and assigning those materials to objects using design visualization software. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Describe different material qualities, surface properties, shading types, and texture maps. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will create basic materials and assign the materials to objects created in a game scene. They will take a screenshot and place it in a PowerPoint slide that the student will use to present his or her creation to the class.</p>	
<p>d. Demonstrate space design by layering multiple texture maps onto a surface to create a composite image using design visualization software. (DOK2)</p>	<p>d. Discuss the use of layers and texture maps in relation to surfaces and composite images. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Describe mapping attributes. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will use texture, opacity, and bump mapping on surfaces in order to create a composite image.</p>	<p>d. Peer Evaluation Rubric</p>
<p>e. Demonstrate the application of sub-maps on similar objects to give unique identity. (DOK2)</p>	<p>e. Discuss the use of sub-maps in assigning unique identities. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will apply multiple sub-maps to obtain a mixture of images leading to unique identities for multiple objects. Students will write a summarization of how unique identities are accomplished.</p>	<p>e. Unique Identities Rubric</p>

**Competency 3:** Manipulate three-dimensional aspects of the world design by adjusting cameras and lighting and adding special effects. (DOK2) <sup>VDG.30, VGD.34</sup>

**Suggested Enduring Understandings**

1. It is important for students to learn how to manipulate a three-dimensional world by adjusting camera angles and lighting and special effects within design visualization software.
2. Understanding how camera perspective can impact the gamer's experience is an important concept to grasp as one develops a game.

**Suggested Essential Questions**

1. How important are camera angles in a game environment?
2. What effect does lighting have on the game environment?
3. What are special effects, and how can they be used to enhance the 3-D game world?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Identify camera perspective and the effects on the game world and gameplay. (DOK1)</p>	<p>a. Discuss cameras, camera angles, and camera perspective and the effects on the game world and gameplay. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will define the following terms related to cameras: <sup>CS7, CS9, R4, T3, T6</sup></p> <ul style="list-style-type: none"> <li>• Perspective</li> </ul>	<p>a. Written test to assess knowledge of terms</p>

	<ul style="list-style-type: none"> <li>• Omnipresent</li> <li>• Aerial (top-down)</li> <li>• Isometric</li> <li>• Side-scrolling (flat/side view)</li> <li>• Elevation</li> </ul>	
b. Demonstrate the creation of a camera and the adjustment of the camera angle and perspective. (DOK2)	<p>b. Explain and exhibit the creation of a camera and the adjustment of the camera angle and perspective. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will create a camera using design visualization software and adjust the angle to give different perspectives to their game world.</p>	b. Camera Rubric
c. Demonstrate the use of different lighting methods. (DOK2)	<p>c. Discuss the process of creating illumination in a game world by using various lighting methods. Discuss the difference in key lighting and fill lighting. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will define the following terms related to lighting methods: <small>CS7, CS9, R4, T3, T6</small></p> <ul style="list-style-type: none"> <li>• Photographic illumination</li> <li>• Sky portal</li> <li>• Photographic exposure</li> <li>• Photometric lighting</li> <li>• Source objects</li> </ul> <p>Students will create conditions for early, midday, late-day, and nighttime illumination in their game world. Students will customize lighting exposure to uniquely identify their game world and scenes and print the image for peer evaluation.</p>	<p>c. Written test to assess knowledge of terms</p> <p>Peer Evaluation Rubric</p>
d. Demonstrate the use of particle systems, lens effects, and constraints to create special effects in a game world. (DOK2)	<p>d. Discuss the use of particle systems, lens effects, and constraints in the creation of special effects for a game world. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will use particles systems and editors, along with flow animation, to create a range of special effects to include liquid flow, objects falling, and a tumbling down stair effect.</p>	<p>d. Graded images</p> <p>Special Effects Checklist</p>

# Standards

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## **IGDA Standards**

- VG.D.30 Motion Graphics
- VG.D.31 Visual Asset Generation
- VG.D.33 Architecture
- VG.D.34 Working with 3-D Hardware

## **21st Century Learning Standards**

- CS6 Creativity and Innovation
- CS7 Critical Thinking and Problem Solving
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy
- CS12 Flexibility and Adaptability
- CS13 Initiative and Self-Direction
- CS14 Social and Cross-Cultural Skills
- CS15 Productivity and Accountability
- CS16 Leadership and Responsibility

## **National Educational Technology Standards for Students**

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T5 Digital Citizenship
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- R4 Meaning of Words
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W4 Organizing Ideas



## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

## Suggested Rubrics and Checklists

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## Unit 10: Character Development and Animation

**Competency 1:** Develop an understanding of the principles and history of visual asset generation. (DOK1)<sup>VGD.30,</sup>  
VGD.31

### Suggested Enduring Understandings

1. Students should learn the principles and history of character development and animation.
2. In order to develop sound characters for a game, students must understand the role of the character, how that character develops throughout the game, and how a character's visual presence aids in defining the character.

### Suggested Essential Questions

1. What are the key developments in the history of animation?
2. How is game animation different from other entertainment media?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the developments in the history of game design and animation. (DOK1)	a. Identify the developments to include the following terminology: <sup>CS7, CS9, R4, T3, T6</sup> <ul style="list-style-type: none"> <li>• Animation</li> <li>• Thaumatrope</li> <li>• Player characters</li> <li>• NPC's non-player characters</li> <li>• Character types</li> <li>• Archetypes</li> <li>• Hero</li> <li>• Shadow</li> <li>• Mentor</li> <li>• Allies</li> <li>• Guardian</li> <li>• Trickster</li> <li>• Herald</li> <li>• Protagonist</li> <li>• Antagonist</li> <li>• Transformational</li> <li>• Exaggerated</li> <li>• Realistic</li> <li>• Co-protagonist</li> <li>• Character triangle</li> <li>• Character arc</li> <li>• Intrapersonal</li> <li>• Interpersonal</li> <li>• Team</li> <li>• Community</li> <li>• Humanity</li> <li>• POV</li> </ul>	a. Written test to assess knowledge of terms
Students will define the terms.		
b. Discuss character types	b. Describe each character type and archetype. <sup>CS8,</sup>	b. Presentation Rubric

<p>and archetypes in relationship to character development. (DOK1)</p>	<p>CS9, CS10, CS11, T2, T3, T6</p> <p>In a PowerPoint presentation, students will list the five common character types and give an example of each. In addition, students will create a list of the Jungian archetypes and the other classic character types while giving an example of each.</p>	
<p>c. Describe ways that characters develop throughout the course of playing a game. (DOK1)</p>	<p>c. Discuss the aspects of character development in relationship to the story structure. CS6, CS8, CS9, CS10, CS11, T2, T3, T6</p> <p>Discuss character triangle and character arc, and ask students to write a two-page report explaining character triangle and character arc as character development elements. W2, W4, W5</p> <p>Students will choose three characters from a game and discuss the character's type and significance in the playing of the game. They will discuss what they like and do not like about the character.</p>	<p>c. Report Rubric</p> <p>Participation Rubric</p>
<p>d. Discuss character identity through names and verbal and visual character development. (DOK1)</p>	<p>d. Discuss how a character's role in a game is in direct correlation with the character's name and visual/physical characteristics. Students will create a customized character based on themselves and describe the character based on the following: CS6, CS8, CS9, CS10, CS11, W4, W5, T2, T3, T6</p> <ol style="list-style-type: none"> <li>1. Name</li> <li>2. Type (class, archetype, etc.)</li> <li>3. Personality characteristics</li> <li>4. Physical characteristics</li> <li>5. Action/Movement</li> <li>6. Skill</li> <li>7. Verbal characteristics</li> <li>8. Historical background</li> <li>9. Relevance to a game story synopsis</li> </ol>	<p>d. Character Rubric</p>
<p>e. Discuss the differences in characters from different media. (DOK1)</p>	<p>e. Discuss how film characters have changed over the course of history and how characters in film differ from characters in games. CS6, CS8, CS9, CS10, T2, T3, T6</p> <p>Students will research and create a time line comparing the changes in film characters and game characters.</p>	<p>e. Time line Rubric</p>

**Competency 2: Examine the process of developing visual assets. (DOK1)** VGD.30, VGD.31

**Suggested Enduring Understandings**

1. It is important for students to learn how to develop game characters utilizing software animation.
2. Understanding the importance of the hierarchy of animation is vital to a visually appealing game.

**Suggested Essential Questions**

1. What is the significance of time in animation?
2. What is animation hierarchy?
3. How do visual features reflect the character’s personality?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Discuss the importance of time in animation. (DOK1)</p>	<p>a. Discuss time in relation to animation, and compare frames per second in game design to film and video. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will manipulate the keyframe in the design visualization software.</p> <p>Students will set keys and key attributes at different times in order to produce different motion(s).</p>	<p>a. Teacher observation</p>
<p>b. Describe the process of animation and animation techniques. (DOK1)</p>	<p>b. Discuss keyframing, auto keys, track view, timing, and path animation. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will attach objects to a path and assign a follow application.</p>	<p>b. Peer Evaluation Rubric</p>
<p>c. Describe the characteristics of reactive animation. (DOK1)</p>	<p>c. Discuss the process of cause and effect in relation to reactive animation. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will give examples of cause-and-effect situations. The students will set keys that will allow the action of one object to “drive” the action of another object.</p>	<p>c. Animation Rubric</p>
<p>d. Describe animation curves, path constraints, and alternative pivot points and how to edit them. (DOK1)</p>	<p>d. Discuss the graph/curve editor and curve tangents in the design visualization software. <small>CS6, CS8, CS9, CS10, CS11, M5, T2, T3, T6</small></p> <p>Students will create bouncing animation using transforms, ghosting, and the curve editor. Students will create looping and animate an object.</p> <p>Students will animate a spacefighter to fly along a path using path constraints and blended paths.</p> <p>Students will animate Mars and its moons by altering pivot points, and they will animate opacity mapped plane objects.</p>	<p>d. Teacher observation</p> <p>Animation Rubric</p>

	Students will manage animated components of a model using list controllers, define controller behavior, and automate the assignment of list controllers.	
e. Describe hierarchical animation. (DOK1)	<p>e. Discuss the building of a hierarchy in animation by using the parenting or grouping method. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will create and control virtual skeletons, which will drive the motion of the characters.</p> <p>Students will animate bipeds with freeform and footstep animations, add spring and jumps, and add stop and start motions.</p> <p>Students will combine animation clips and use motion flow to create an animation sequence.</p> <p>Students will link different objects' biped limbs to objects.</p> <p>Students will customize a biped structure, pose the biped to fit a mesh, adjust vertex assignments and envelope parameters, and fine-tune shapes and sizes of envelopes.</p> <p>Students will simulate hand movement, lifting and pushing objects, and work with props.</p>	<p>e. Teacher observation</p> <p>Animation Rubric</p>

# Standards

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## **IGDA Standards**

- VG.D.30 Motion Graphics
- VG.D.31 Visual Asset Generation

## **21st Century Learning Standards**

- CS6 Creativity and Innovation
- CS7 Critical Thinking and Problem Solving
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy

## **National Educational Technology Standards for Students**

- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- R4 Meaning of Words
- M5 Graphical Representations
- W2 Focusing on the Topic
- W4 Organizing Ideas
- W5 Using Language

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

Marks, A., & Novak, J. (2009). *Game development essentials: Game audio development*. Delmar/Cengage Learning.



## Suggested Rubrics and Checklists

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# Audio and Video Production

## Unit 11: Audio Design

**Competency 1:** Research audio history and theory. (DOK1) VG.D.38, VG.D40

### Suggested Enduring Understandings

1. Students should learn the history and theory related to audio for game design and development.
2. Students will better understand the components of a sound system and game audio formats.

### Suggested Essential Questions

1. What are the historical components of game audio?
2. What are the primary functions of audio in game design?
3. What are the different formats for game audio?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the components of audio and game design. (DOK1)	<p>a. Introduce students to game audio design by giving a brief overview of game audio. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will identify key terms relative to game audio. Terms may include the following: <small>CS7, CS9, R4, T3, T6</small></p> <ul style="list-style-type: none"> <li>• Sound</li> <li>• Audible</li> <li>• Noise</li> <li>• Sampled sound</li> <li>• Frequency</li> <li>• Pitch</li> <li>• Frequency modulation synthesis</li> <li>• Wave table synthesis</li> <li>• Sound waves</li> <li>• Wavelength</li> <li>• Amplitude</li> <li>• Doppler effect</li> <li>• Intensity</li> <li>• Acoustics</li> <li>• Harmonics</li> <li>• Gramophone</li> <li>• Soundtrack</li> <li>• Phonograph</li> <li>• Microphone</li> <li>• Tracked audio</li> <li>• MIDI</li> <li>• Voiceovers</li> </ul>	a. Written test to assess knowledge of terms
b. Discuss the history of audio components and their importance in game design. (DOK1)	<p>b. Describe the beginnings of the recognition of sounds and how they changed throughout time. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will create a time line presentation outlining significant events and inventions</p>	<p>b. Student Participation Rubric</p> <p>Presentation Rubric</p> <p>Poster Rubric</p>

relative to sound and audio technology.

Students will create a poster that reflects their interpretation of how sounds are made and measured.

c. Describe the components of a sound system and game audio formats. (DOK1)	c. Discuss the basic components of a sound system and game audio formats. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small>  Students will create a poster illustrating a basic sound system incorporating the equipment needed for composing, recording, sequencing, capturing, sampling, editing, and mastering.	c. Poster Rubric
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**Competency 2: Understand the functions of audio design fundamentals (creating the atmosphere) and interactive audio for game design. (DOK1)** VG.D.44, VG.D.45

**Suggested Enduring Understandings**

1. Sound has a large influence on the overall game experience. Students should learn that effective sound can create the entire atmosphere of a game.
2. Students will learn the purpose of audio in games and how they can set the mood for a game.

**Suggested Essential Questions**

1. What is the purpose of sound in the development of games?
2. What are the various sound design disciplines?
3. What is the process of creating game sound?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Describe how sound can set the mood for a game. (DOK1)	<p>a. Discuss the reasons for adding sound to games. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will identify the purposes of sound effects in game design and how the effects set the mood for the gamer.</p> <p>Students will play three games and identify the purposes of the sound effects in each game by answering the following questions:</p> <ol style="list-style-type: none"> <li>1. How do the sounds provide clues to the surroundings?</li> <li>2. How do the sounds add value to the game?</li> <li>3. What mood do the sounds project?</li> <li>4. Do the sounds establish brand identity? How?</li> <li>5. Do the sounds create tactile and interface feedback for the gamer? How?</li> <li>6. How appropriate are the sound effects?</li> <li>7. Do the sounds enhance the entertainment value of the game? How?</li> <li>8. Are any of the sounds associated with logos, cinematics, menu screens, or environmental effects? Why or why not?</li> </ol>	a. Grade student answers to questions.
b. Create digital sound effects. (DOK3)	b. Discuss the technical considerations and processes related to the creation of digital	b. Teacher observation

		<p>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</p> <p>sound effects.</p> <p>Students will create, produce, test, and edit digital sound effects using audio design software.</p>	
c. Describe the purpose and primary functions of music in video games. (DOK1)	c. Explain the musical instrument digital interface (MIDI) and its function in video games. CS6, CS8, CS9, CS10, CS11, T2, T3, T6	<p>Discuss MIDI, and then ask the students to write a two-page essay defining and explaining the following: CS7, CS9, E1, R4, W4, W5, T3, T6</p> <ol style="list-style-type: none"> <li>1. What is adaptive and interactive music?</li> <li>2. What is horizontal re-sequencing?</li> <li>3. What is vertical re-orchestration?</li> <li>4. What are music loops? Why are they used?</li> <li>5. What are ambient tracks?</li> </ol> <p>Students will listen to music from video games and answer the following:</p> <ol style="list-style-type: none"> <li>1. How does the music set the mood?</li> <li>2. Does the music identify the era and location related to the game?</li> <li>3. How does the music set the game pace?</li> <li>4. Does the music create immersion?</li> <li>5. How appropriate is the music in relation to credit sequences, cinematics, menu screens, background, plot, and final cues?</li> </ol>	c. Grade answers.
d. Demonstrate music composition. (DOK3)	d. Discuss musical themes, composition preparation, and music creation methods using MIDI hardware and software. CS6, CS8, CS9, CS10, CS11, T2, T3, T6	<p>Students will compose, edit, master, and test a 2- to 3-minute original music piece for a video game.</p>	d. Music Composition Rubric
e. Explain voice-overs and how they add personality to game characters. (DOK1)	e. Discuss voice-overs for video games. CS6, CS8, CS9, CS10, CS11, T2, T3, T6	<p>Students will explain the purpose of voice-overs in video games.</p> <p>Students will list the types of voice-overs.</p> <p>Students will describe a typical voice-over session and the process of recording voice-overs.</p>	e. Student participation
f. Demonstrate the creation of voice-overs, edit, and test voice-overs. (DOK3)	f. Discuss the process of recording, editing, and testing voice-overs. Describe the voice-over recording process. CS6, CS8, CS9, CS10, CS11, T2, T3, T6	<p>Students will create, edit, and test voice-</p>	f. Voice-Over Rubric  Group Participation Rubric

overs.

Students will direct a voice-over recording session in small groups.

**Competency 3: Apply fundamentals of 3-D audio in order to blend video game audio elements. (DOK2) <sup>VGD.48</sup>**

**Suggested Enduring Understandings**

1. It is important for students to learn how to balance the music, sound effects, and dialogue creating a total soundscape for video games.
2. Students will obtain a better understanding of the effect technology has had on game audio.

**Suggested Essential Questions**

1. What are the factors that determine priority given to playback of music, sound effect, and dialogue?
2. What role does technology play in the final quality of individual game sounds?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Describe the audio asset assembly, delivery, and priority process. (DOK1)	<p>a. Discuss audio asset assembly, delivery, and priorities. Discuss how these are established. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will conduct online research on the role of the audio director in relation to game design and the balance of music, sound effects, and dialogue.</p> <p>Students will create a flowchart of audio priorities for a game they might create.</p>	a. Participation Rubric
b. Demonstrate the difference between occlusion and obstruction and the effect on game audio. (DOK3)	<p>b. Discuss occlusion and obstruction, and give examples of each. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will differentiate the results of occlusion and obstruction in small groups. Students will use the following filters to create examples:</p> <ul style="list-style-type: none"> <li>• Doors</li> <li>• Tables</li> <li>• Walls</li> <li>• Other barriers</li> </ul>	b. Group Participation Rubric
c. Describe the effect technology has had in the past and may have in the future on game audio. (DOK1)	<p>c. Discuss emerging technologies related to game audio design. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will conduct online research to find emerging technologies related to audio design and create a slide presentation that represents their findings.</p>	c. Presentation Rubric

# Standards

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## **IGDA Standards**

- VG.D.38 Audio History and Theory
- VG.D.40 Basic Studio Skills
- VG.D.44 Audio Design Fundamentals
- VG.D.45 Introduction to Interactive Audio
- VG.D.48 3-D Audio

## **21st Century Learning Standards**

- CS6 Creativity and Innovation
- CS7 Critical Thinking and Problem Solving
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy

## **National Educational Technology Standards for Students**

- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- E1 Topic Development in Terms of Purpose and Focus
- R4 Meaning of Words
- W4 Organizing Ideas
- W5 Using Language

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

Marks, A., & Novak, J. (2009). *Game development essentials: Game audio development*. Delmar/Cengage Learning.

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Participation Rubric

	<b>Beginning 1 point</b>	<b>Developing 2 points</b>	<b>Accomplished 3 points</b>	<b>Exemplary 4 points</b>	<b>Score</b>
<b>Group Discussions</b>	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
<b>On-Task Behavior</b>	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
<b>Helping Others</b>	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
<b>Listening</b>	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
<b>Total Score</b>					

**Comments:**

## Unit 12: Video Game Programming

**Competency 1:** Analyze the structure of the C++ language. (DOK1) <sup>VGD.24</sup>

### Suggested Enduring Understandings

1. Students should develop a basic understanding of the C++ programming language.
2. Programmers follow steps in a program development cycle to create a computer program.
3. C++ allows programmers to create GUI applications.

### Suggested Essential Questions

1. What is C++?
2. How is C++ related to game logic?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Define C++ programming terms. (DOK1)	<p>a. Discuss the purpose of programming languages and compilers. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will define the following terms in relation to C++ programming: <sup>CS7, CS9, R4, T3, T4, T6</sup></p> <ul style="list-style-type: none"> <li>• Binary code</li> <li>• Numbers</li> <li>• Data types</li> <li>• Loops</li> <li>• Election</li> <li>• Structure</li> <li>• Functions</li> <li>• Source code</li> <li>• Algorithm</li> <li>• Syntax</li> <li>• Syntax error</li> <li>• Run-time error</li> <li>• Debugging</li> <li>• Executable file</li> <li>• Compiler</li> <li>• Scripting language</li> <li>• Array</li> <li>• If/Then/Else</li> <li>• ASCII</li> </ul>	a. Written test to assess knowledge of terms
b. Explain the program development cycle to include input/output, processing, and storage. (DOK1)	<p>b. Discuss the purpose of the program development cycle used to run, debug, and produce programs. <sup>CS6, CS7, CS8, CS9, CS10, CS11, T2, T3, T4, T6</sup></p> <p>Students will illustrate the program development cycle to include input/output, processing, and storage. Students will assemble in small groups and use a textbook or the Internet to find information on the program development cycle. Students will then come together as a large group and construct a jigsaw puzzle that</p>	<p>b. Program Development Checklist</p> <p>Group Participation Rubric</p> <p>Puzzle Checklist</p>

		illustrates the program development cycle.	
c. Convert binary code to decimals. (DOK2)	c. Discuss binary code, and explain the conversion process. <small>CS6, CS8, CS9, CS10, CS11, M3, T2, T3, T6</small>	Students will calculate their age, their parents' ages, and the amount of money they would like to earn as adults as binary numbers.	c. Conversion Checklist
d. Construct an algorithm for computer programming technology. (DOK2)	d. Explain algorithms and how students are already familiar with them. For example, algorithms are found in recipes for cooking and instructions for assembling a bicycle. <small>CS6, CS8, CS9, CS10, CS11, M3, T2, T3, T6</small>	Distribute the traveling salesman activity found at <a href="http://www.cs.sunysb.edu/~algorithm/files/traveling-salesman.shtml">http://www.cs.sunysb.edu/~algorithm/files/traveling-salesman.shtml</a> . Students will connect the businesses in the shortest path possible to eliminate cost for the traveling salesman. Explain that gas and time have a significant cost to a traveling salesman. UPS uses an algorithm that is similar to this for drivers to follow for deliveries. <small>CS6, CS8, CS9, CS10, CS11, M3, M4, T2, T3, T6</small>	d. Participation Rubric
e. Demonstrate screen output using the C++ language. (DOK2)	e. Explain C++ source code. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small>	Students will write an algorithm that details the shortest route possible from their house to a local shopping center.	e. Story Checklist
f. Classify variable and constants. (DOK1)	f. Discuss the concept of variable and constants in C++ and how they relate to algebraic equations. <small>CS6, CS8, CS9, CS10, CS11, M4, T2, T3, T6</small>	Students will analyze the C++ program structure from a sample program.  Students will prepare C++ source code by writing a four-sentence story using C++ syntax.	f. Participation Rubric
g. Create, run, and debug an original program to input data, process data, and print a report. (DOK 3)	g. Demonstrate how to create, run, and debug a program to create a report. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T4, T6</small>	Students will use the Internet to research C++ tutorials that show examples of constants. An example is at <a href="http://www.cprogramming.com/tutorial/cpreprocessor.html">http://www.cprogramming.com/tutorial/cpreprocessor.html</a> . Have students identify constants.	g. Program Rubric
		Allow students to produce an original program to input, process data, and output a printed report.	

<p>h. Create programs that perform calculations using arithmetic operations to include addition, subtraction, multiplication, division, and exponentiation. (DOK 3)</p>	<p>h. Discuss the meanings of computational and logical operations, and classify components into each. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Divide the students into groups, and have them translate algebraic formulas into programming statements using the C++ syntax to produce a usable program.</p> <p>Students will evaluate peer work and make suggestions for improvement.</p>	<p>h. Participation Rubric</p> <p>Group Participation Rubric</p> <p>Peer Evaluation Rubric</p>
<p>i. Create programs that include decision, selection, and iteration statements to include IF/THEN statements, Case statements, Do loops, and For/Next loops. (DOK 3)</p>	<p>i. Demonstrate the various types of programs, and show examples of IF/THEN statements and controlled loops. <small>CS6, CS7, CS8, CS9, CS10, CS11, T2, T3, T4, T6</small></p> <p>Students will complete an online tutorial at <a href="http://www.cprogramming.com/tutorial/lesson3.html">http://www.cprogramming.com/tutorial/lesson3.html</a> that demonstrates the various programs. They will also complete a quiz at the end of the lesson at <a href="http://www.cprogramming.com/tutorial/quiz/quiz3.html">http://www.cprogramming.com/tutorial/quiz/quiz3.html</a> about C++ loops.</p> <p>Students will construct programs that illustrate IF/THEN statements and controlled loops. Sample programs may include a program that does the following:</p> <ul style="list-style-type: none"> <li>• Finds the sum of a given number of integers</li> <li>• Finds the product of a given number of real numbers</li> <li>• Finds the average of a dynamically set number of test scores</li> <li>• Finds the sum of some integers until a specific number is entered.</li> </ul>	<p>i. Program Rubric</p>
<p>j. Create programs that use array/table structures. (DOK 3)</p>	<p>j. Discuss the use of and show examples of processing arrays. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Develop a script that executes a processing array in front of the class. Explain each component of the script as it is developed. <small>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</small></p> <p>Students will develop one- and two-dimensional array programs.</p> <p>Students will debug programs that process arrays, which may include use of ASCII to sort and/or string function processing.</p>	<p>j. Array Rubric</p>

**Competency 2: Analyze the purpose, importance, and structure of game engines. (DOK1) <sup>VGD.13</sup>**

**Suggested Enduring Understandings**

1. It is important for students to develop an understanding of the purpose, importance, structure, and design of game engines.
2. It is important for students to create, manipulate, and test game engine programs.

**Suggested Essential Questions**

1. What is a game engine?
2. Why are game engines necessary to the game development process?
3. How do game engines work?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
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a. Identify the core components of game engines relative to game development. (DOK1)

a. Discuss game engines and their importance in the game development process. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup>

a. Written test to assess knowledge of terms

Students will define the following terms related to game engines: <sup>CS7, CS9, R4, T3, T6</sup>

- Vector data type
- String data
- Culling
- Rasterizing
- Rendering
- Open source
- Coding
- Refactor
- DirectX
- Direct Link Library (DLL)
- Emulation
- Integrated Development Environment (IDE)
- Open AL
- Open GL
- Software Development Kit (SDK)
- Toolset
- Object-oriented design
- Prototyping

Reference:

- <http://gpwiki.org/index.php/Glossary> or  
<http://www.gamedev.net/dict>

b. Discuss the importance of game engines in the game development process. (DOK2)

b. Explain the difference in game engines and how they are used to create games. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup>

b. Compare and Contrast Chart Rubric

Students will research the Internet to find open source game development engines and compare and contrast at least five engines with regard to the following criteria:

- Language
- Operating system
- Graphics

Presentation Rubric

- 
- Availability of documentation
  - Release status
  - Features
  - Ease of use
  - Stability
  - Support availability
  - Origination date
  - Last updated
  - Availability of source code
  - Price
  - Pros
  - Cons

Students will present their findings to the class.

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c. Demonstrate object-oriented design and code reuse patterns and the applications among game developers. (DOK2)

c. Explain object-oriented design and code reuse patterns and how they are applied in the game development industry. List each reuse pattern to include the following: <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup>

c. Poster Rubric

1. The object factory
2. The singleton
3. The flyweight
4. The chain of responsibility
5. The iterator and reverse iterator
6. The template and strategy methods
7. The observer
8. The command
9. The decorator
10. The façade
11. The mediator
12. The state

Students will research object-oriented design and code reuse patterns and demonstrate their use by creating a poster that represents each pattern.

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d. Develop an understanding of the elements of the game design engine. (DOK1)

d. Discuss the elements of a game design engine to include the following: <sup>CS6, CS8, CS9, CS10, CS11, R4, T2, T3, T6</sup>

d. Participation Rubric

1. Tools and data
2. The system
3. Sub-systems
4. Console
5. Support
6. Rendering
7. Interface

Reference:

<http://www.flipcode.com/archives/ElementsOfAGameEngine.shtml>

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Students will identify each element of a tic-tac-toe game. An example would be as follows:

```

Setup

Clear Game State
Select Piece that Moves First (X or O)
Iteration
If GameOver Throw Exception
Make Move by turning a click in the UI into a
game engine method MakeMove(cellX, cellY,
PiecesEnumeration.O)
If cellX or cellY is taken or PiecesEnumeration
doesn't mesh with the current move piece
Throw Exception
Else SetStateOfBoard
CheckForWinConditions
If WinConditions SetEndGameState Goto
Conclusion
Else CheckForDrawConditions
SetEndGameState Goto Conclusion
Conclusion
ServeResults
  
```

e. Create game code using a game engine. (DOK3)

e. Demonstrate the use of a game engine. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup>

e. Game Code Rubric

Students will create game code using a game engine. Students may reuse existing code.

**Competency 3:** Develop an understanding of computer networks as they relate to game design technology. (DOK1)<sup>VGD.23</sup>

Suggested Enduring Understandings	Suggested Essential Questions
<ol style="list-style-type: none"> <li>1. A network is a collection of hardware and software working together as a system to transport data from point to point.</li> <li>2. Game developers rely heavily on computer networks for gaming activities. It is important for students to learn the components of a computer network and how the components function for game-related activities.</li> </ol>	<ol style="list-style-type: none"> <li>1. How important are networks in the game design industry?</li> <li>2. What are the components of a computer network?</li> <li>3. What topologies might be used in the game design industry?</li> <li>4. What standards might apply to networks in the game design industry?</li> </ol>

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Define terminology related to computer networks. (DOK1)	a. Lead students in a discussion of different sets of terminology (MUDs, LAN parties, MMOGs, and MMORPGs) they use each day. Emphasize the importance of using the correct terminology in the game design industry. Provide a list of terms. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup>	a. Assess knowledge of terms through observation.

Students will play a quiz game using networking terms as a class review.

<p>b. Identify hardware components needed to network two or more computers, such as an NIC card, cables, hubs, switches, and a server. (DOK1)</p>	<p>b. Describe a variety of network components and how each is used. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will work in small groups to create a poster that illustrates a variety of computer network components and present it to the class. They may use photographs, digital images, or drawings.</p>	<p>b. Poster Rubric</p>
<p>c. Identify the various operating systems for networks such as Novell, Windows NT, Windows XP, Windows Vista, UNIX, Linux, and Mac OS. (DOK1)</p>	<p>c. Provide students with screenshots or hands-on experience with various network operating systems. Discuss why different NOS would be used in particular situations. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will compare and contrast the various NOS based on practicality of use in particular situations.</p>	<p>c. Compare and Contrast Chart Rubric</p>
<p>d. Discuss examples of recognized network topologies. (DOK1)</p>	<p>d. Discuss recognized network topologies. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will include the discussion material in a graphic organizer.</p>	<p>d. Teacher observation for accuracy</p>
<p>e. Compare network topologies. (DOK1)</p>	<p>e. Have students work in teams to illustrate the types of network topologies. Have the groups research and debate the advantages and disadvantages of accepted network topologies.</p>	<p>e. Group Participation Rubric</p>
<p>f. Discuss network protocols related to the game design industry. (DOK3)</p>	<p>f. Have students research, identify, and discuss various protocols such as IP addresses in relation to the game design industry. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Students will draw a network topology that they would use for their game. Students will label and define each component of the network.</p>	<p>f. Use formative assessment such as questioning or guided notes to check for understanding.</p> <p>Participation Rubric</p>



# Standards

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## **IGDA Standards**

VG.D.13 Game Engine Design

VG.D.23 Networks

VG.D.24 Game Logic

## **21st Century Learning Standards**

CS6 Creativity and Innovation

CS7 Critical Thinking and Problem Solving

CS8 Communication and Collaboration

CS9 Information Literacy

CS10 Media Literacy

CS11 ICT Literacy

## **National Educational Technology Standards for Students**

T2 Communication and Collaboration

T3 Research and Information Fluency

T4 Critical Thinking, Problem Solving, and Decision Making

T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

M3 Numbers: Concepts and Properties

M4 Expressions, Equations, and Inequalities

R4 Meaning of Words

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

Rollings, A., & Morris, D. (2004). *Game architecture and design: A new edition*. New Riders Publishing.

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Participation Rubric

	<b>Beginning 1 point</b>	<b>Developing 2 points</b>	<b>Accomplished 3 points</b>	<b>Exemplary 4 points</b>	<b>Score</b>
<b>Group Discussions</b>	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
<b>On-Task Behavior</b>	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
<b>Helping Others</b>	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
<b>Listening</b>	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
<b>Total Score</b>					

**Comments:**

## Unit 13: Video Game Production

**Competency 1:** Identify the company roles and team roles and responsibilities related to the game development process. (DOK1)<sup>VG.D.57, VG.D.60</sup>

### Suggested Enduring Understandings

1. There are several roles that companies play in the game development process.
2. There are team roles and responsibilities associated with all levels of game development.
3. There are specific techniques and tools utilized by different team members during game development.

### Suggested Essential Questions

1. What are some of the roles that companies play in the game development process?
2. What are team members responsible for in game development?
3. What are some of the techniques and tools utilized by different team members during game development?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Describe the elements of leadership and the qualities necessary to become a successful leader. (DOK1)</p> <p>“Effective team management improves productivity by creating a harmonious, problem-solving environment. Good leaders may not directly influence game design, but they empower their teams to do their best and to be objective about their work.” -John Hight and Jeannie Novak</p>	<p>a. Explain leadership, and give examples of successful leaders in the game design industry. Include qualities like honesty, adaptability, conflict resolution, energy, productivity, communication, and accountability.<sup>CS6, CS8, CS9, CS10, CS11, CS15, CS16, T2, T3, T6</sup></p> <p>Students will complete a leadership test at <a href="http://www.yourleadershiplegacy.com/assessment/assessment.php">www.yourleadershiplegacy.com/assessment/assessment.php</a> or <a href="http://www.mindtools.com/pages/article/newLDR_01.htm">http://www.mindtools.com/pages/article/newLDR_01.htm</a> to interpret individual leadership skills.</p> <p>Students will use role-play to improve their leadership skills. Students will take turns establishing teams and assigning roles and responsibilities. Team members will evaluate leadership effectiveness.</p>	<p>a. Teacher observation</p> <p>Role-Play Rubric</p> <p>Peer Evaluation Rubric</p>
<p>b. Identify the company roles related to the game development process. (DOK1)</p>	<p>b. Describe the different companies that may be involved in the making of a game and the roles they may serve.<sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Terms may include the following:</p> <ul style="list-style-type: none"> <li>• Developer</li> <li>• Publisher</li> <li>• Third-party developer</li> <li>• Manufacturer</li> <li>• Licensor<sup>CS7, CS9, R4, T3, T6</sup></li> </ul> <p>Students will define the terms listed on the</p>	<p>b. Written test to assess knowledge of terms</p>

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Video Game Production Worksheet.

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c. Identify game development team roles involved in the game development process. (DOK1)

c. Describe the team roles involved in the game development process and their responsibilities. CS6, CS8, CS9, CS10, CS11, T2, T3, T6

c. Written test to assess knowledge of terms

Participation Rubric

Poster Rubric

Terms may include the following:

- Production
- Executive producer
- Producer
- Associate producer
- Assistant producer
- Design
- Creative director
- Design director
- Lead designer
- Interface designer
- Level designer
- Art director
- Lead artist
- Concept artist
- Technical artist
- Modeler
- Texture artist
- Animator
- Technical director
- Lead programmer
- Engine programmer
- Tools programmer
- Graphics programmer
- Network programmer
- AI programmer
- Audio programmer
- Physics programmer
- Interface programmer
- Associate programmer
- Audio director
- Composer
- Sound designer
- Voice-over artist
- Testing manager
- Lead tester
- Format tester
- QA tester
- Beta tester
- Focus tester CS7, CS9, R4, T3, T6

Students will discuss how a team might be assembled for a game development studio using the terms given.

Students will create a poster that identifies their

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		teams and the responsibilities of each team member.	
d. Explain the phases associated with developing a game from concept to completion. (DOK1)	d. Discuss the activities related to building a game from beginning to end. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup>	<p>Students will describe the phases of game development to include concept, pre-production, production, and postproduction categories.</p> <p>Students will explain the sub-categories of game development and identify the primary responsible party and the secondary contributor.</p>	d. Participation Rubric
e. Explain the Five-Stage Team Management Model and how it can be used in the game development process. (DOK1)	e. Discuss the Five-Stage Team Management Model: <sup>CS6, CS8, CS9, CS16, T2, T3, T6</sup>	<ul style="list-style-type: none"> <li>• Forming</li> <li>• Storming</li> <li>• Norming</li> <li>• Performing</li> <li>• Adjourning</li> </ul> <p>Students will define each stage and explain the goals associated with each stage.</p>	e. Teacher observation
f. Explain and demonstrate how to conduct meetings. (DOK2)	f. Explain the meeting process. <sup>CS6, CS8, CS9, CS10, CS11, CS16, T2, T3, T6</sup>	<p>Students will discuss the basic rules for conducting meetings.</p> <p>Students will conduct a mock production meeting with their team members taking turns leading the discussion. Peers will evaluate the leaders and meetings.</p>	f. Peer Evaluation Rubric

**Competency 2: Plan, create, interpret, and analyze budgets for game design and development. (DOK2)** <sup>VGd.54, VGd.56</sup>

**Suggested Enduring Understandings**

1. It is important for students to learn the importance of budgets and how to plan for expenses, create spreadsheets, interpret costs, and perform financial analysis.

**Suggested Essential Questions**

1. What is a budget, and what comprises a game design and development budget?
2. What effect does a delay in production have on a game design budget?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the elements of a game design budget. (DOK1)	<p>a. Define terms related to character creation and character types: <sup>CS7, CS9, R4, T3, T6</sup></p> <ul style="list-style-type: none"> <li>• Budget</li> <li>• Fixed costs</li> <li>• Variable costs</li> </ul>	a. Test students on character creation terms.

	<ul style="list-style-type: none"> <li>• Salaries</li> <li>• Administrative expense</li> <li>• Licenses</li> <li>• Travel and entertainment</li> <li>• Research and development</li> <li>• Return on investment (ROI)</li> <li>• Royalties</li> <li>• Production delay</li> <li>• Time-sensitive</li> <li>• Investors</li> <li>• Units sold</li> <li>• Cost of goods sold</li> <li>• Cost off the shelf (COTS)</li> <li>• Distribution costs</li> </ul>	
b. Plan, construct, interpret, and analyze a game design budget. (DOK2)	<p>b. Discuss Microsoft Excel and how it can be used to construct a spreadsheet for a game design budget. <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <p>Discuss expense budgets, including salaries, the cost to consumer off the shelf, and proprietary software costs. Students will write an expense report that should cover the abovementioned items. In addition, students will write a report interpreting the spreadsheet by answering the following questions: <sup>CS6, CS8, CS9, CS10, CS11, M1, M3, M4, E1, E2, W2, W4, W5, T2, T3, T6</sup></p> <ul style="list-style-type: none"> <li>• How much would the company save if the game build was completed 2 days before the deadline?</li> <li>• How much over budget would this project be if the game took 3 weeks to complete?</li> <li>• Should the company build the COTS software features into its proprietary software? Why or why not?</li> </ul>	<p>b. Spreadsheet Rubric</p> <p>Report Rubric</p>

**Competency 3: Apply time and project-management skills. (DOK2)** <sup>VGD.59, VGD.63</sup>

**Suggested Enduring Understandings**

1. It is important for students to learn the stages of game development and how those stages can be managed to produce maximum efficiency and minimum expense.

**Suggested Essential Questions**

1. What are the considerations when managing the game development process from concept to completion?
2. What are the milestones involved in project management?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Explain the components of each stage in the game development process. (DOK1)	<p>a. Discuss the stages of game development related to project management, and explain how to document progress. Include the following: <sup>CS6, CS8, CS9, CS10, CS11, T2, T3, T6</sup></p> <ul style="list-style-type: none"> <li>• Concept</li> <li>• Pre-production</li> </ul>	<p>a. Chart Rubric</p> <p>Peer Evaluation Rubric</p>



- Prototype
- Production
- Alpha
- Beta
- Gold
- Postproduction
- Iterative development

Students will create Pert and Gantt charts to schedule task assignments and work flow using supplied information.

Students will use Microsoft Project to create a work flow chart for their game.

b. Describe the milestones in project management and how they are accomplished. (DOK1)	b. Discuss the milestones that a project manager should be looking for in the development of a game. Include regular builds, first playable builds, alpha, beta, release candidates, gold master, and localization. Students will research the Internet and find at least three postmortems. They will write a short report discussing how they can apply those principles. Students will also explain in the report how they will avoid feature creep and slippage in their projects. <small>CS6, CS8, CS9, CS10, CS11, CS16, E1, E2, W2, W4, W5, T2, T3, T6</small>	b. Report Rubric
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**Competency 4: Communicate with peers, supervisors, and subordinates. (DOK2) <sup>VGD.64</sup>**

**Suggested Enduring Understandings**

1. Effective communication skills are very important in every aspect of game design.
2. Listening, writing, and presentation skills are an important part of communication.

**Suggested Essential Questions**

1. What is rhetoric?
2. Why is communication so important?
3. How should communication be handled in a game design studio?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Explain the communications process. (DOK1)	<p>a. Discuss communication skills and how valuable they are to the success of game design. <small>CS6, CS8, CS9, CS10, CS11, CS14, T2, T3, T6</small></p> <p>Students will research the Internet and find a diagram of the communication process.</p> <p>Students will explain each component of the communication process.</p> <p>Students will divide into groups and role-play the communication with peers, supervisors, and subordinates using basic steps to include the following:</p> <ul style="list-style-type: none"> <li>• Eye contact</li> <li>• Body language</li> <li>• Speech quality</li> </ul>	<p>a. Participation Rubric</p> <p>Peer Evaluation Rubric</p> <p>Role-Play Rubric</p>

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b. Demonstrate active listening skills. (DOK2)

b. Discuss active listening and how it can impact communication. CS6, CS8, CS9, CS10, CS14, CS16, CS11, T2, T3, T6

b. Wright Family Rubric

Students will participate in the Wright Family exercise demonstrating active listening skills.

Divide students into three teams. Ask Team A to prepare a six-question short-answer quiz on vocal communication. Allow 5 minutes. Ask teams B and C to review their class notes on the topic while Team A prepares its quiz. Tell Team A to ask Team B one of its questions. If Team B cannot answer the question or answers incorrectly, Team C may try to answer the question. Team A directs its next question to Team C first and repeats the process. Team A continues to ask questions until the quiz is done.

Ask Team B to prepare a similar quiz on verbal communication. Ask teams A and C to review their class notes on verbal communication while Team B prepares its quiz. Repeat the quiz process from above. Ask Team C to prepare a similar quiz on listening skills while teams A and B review their class notes. Repeat the quiz process again.

Divide students into three groups. Tell the groups that they all have a common goal: to put together a jigsaw puzzle in a limited amount of time. However, each group speaks a different language from the other groups. Each group's language consists of only one word. Assign each group a nonsense word. For example, you might assign group one the word cariffle, group two woobidee, and group three varipip.

Divide the pieces of a jigsaw puzzle among the three groups. Tell groups they have 2 minutes to plan how they want to communicate with the other groups to put together the puzzle. During this planning phase, group members may communicate freely with one another. When the groups join together to build the puzzle, the only words that may be spoken are the nonsense words assigned to each group. For example, group one may only say cariffle while members of group two may only say woobidee. Students must rely on varying the variety, quality, rate, and volume of their vocal communication in order to accomplish their goal.

Give groups 5 minutes to try to put the puzzle together. Remind them to only use their assigned word and to try to communicate by varying their

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vocal characteristics. Ask students to share their insights on what happened during the activity. Discuss how students were able to communicate vocally, even when the words they used were nonsense.

**Competency 5: Discuss quality assurance and the role it plays in game design. (DOK1) <sup>VGD.68</sup>**

**Suggested Enduring Understandings**

1. Quality assurance involves the establishment of standards and procedures for game development.
2. Quality assurance is the testing of a game to ensure that it meets legal and contractual agreements.

**Suggested Essential Questions**

1. Who is involved in quality assurance for game design studios?
2. What are the components of game quality assurance?

**Suggested Performance Indicators**

**Suggested Teaching Strategies**

**Suggested Assessment Strategies**

- a. Identify the various stages of quality assurance (QA) for game development. (DOK1)

- a. Discuss the QA director and the testing team and the activities that may take place in assuring the quality of a game. <sup>CS6, CS8, CS9, CS10, CS11, CS15, CS16, T2, T3, T6</sup>

- a. Participation Rubric

Bring in a guest speaker from the American Society for Quality (ASQ), and have the speaker discuss the general practices of QA personnel and how it impacts the outcome of a product or service. <sup>CS6, CS8, CS9, CS10, CS11, CS15, CS16, T2, T3, T6</sup>

Students will identify the various stages of quality assurance for game development to include playability, focus testing, regression testing, format testing, and compatibility testing.

- b. Identify best practices regarding quality assurance. (DOK1)

- b. Discuss how game design studios use quality assurance. <sup>CS6, CS8, CS9, CS10, CS11, CS15, T2, T3, T6</sup>

- b. Self-Evaluation Rubric

Students will read the article “5 Ways to Best Utilize Quality Assurance” by Billy Stever and identify and explain the five key points.

Students will create their own list of five ways to use quality assurance for their game.

# Standards

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## **IGDA Standards**

- VG.D.54 Budgeting a Development Project
- VG.D.56 Typical Budgets and Budget Categories
- VG.D.57 Team Makeup
- VG.D.58 The Game Development Lifecycle
- VG.D.59 Work flow
- VG.D.60 Group Dynamics
- VG.D.63 Scheduling and Time Management
- VG.D.64 Communication Skills
- VG.D.68 Quality Assurance

## **21st Century Learning Standards**

- CS6 Creativity and Innovation
- CS7 Critical Thinking and Problem Solving
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy
- CS14 Social and Cross-Cultural Skills
- CS15 Productivity and Accountability
- CS16 Leadership and Responsibility

## **National Educational Technology Standards for Students**

- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- E1 Topic Development in Terms of Purpose and Focus
- R4 Meaning of Words
- M1 Basic Operations and Applications
- M3 Numbers: Concepts and Properties
- M4 Expressions, Equations, and Inequalities
- W2 Focusing on the Topic
- W4 Organizing Ideas
- W5 Using Language

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

Novak, J. (2008). *Game development essentials* (2nd ed.). Delmar/Cengage Learning.

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Participation Rubric

	<b>Beginning 1 point</b>	<b>Developing 2 points</b>	<b>Accomplished 3 points</b>	<b>Exemplary 4 points</b>	<b>Score</b>
<b>Group Discussions</b>	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
<b>On-Task Behavior</b>	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
<b>Helping Others</b>	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
<b>Listening</b>	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
<b>Total Score</b>					

**Comments:**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Role-play Rubric

	<b>EXCELLENT</b> <b>(4)</b>	<b>GOOD</b> <b>(3)</b>	<b>AVERAGE</b> <b>(2)</b>	<b>POOR</b> <b>(1)</b>	<b>TOTAL</b>
<b>Accuracy</b>	All information was accurate.	Almost all information was accurate.	Most information was accurate.	Very little information was accurate.	
<b>Role</b>	Excellent character development; student contributed in a significant manner	Good character development; student contributed in a cooperative manner	Fair character development; student may have contributed	Little or no character development; student did not contribute much at all	
<b>Knowledge Gained</b>	The student can clearly explain several ways in which his or her character "saw" things differently than other characters and can explain why.	The student can clearly explain several ways in which his or her character "saw" things differently than other characters.	The student can clearly explain one way in which his or her character "saw" things differently than other characters.	The student cannot explain any way in which his or her character "saw" things differently than other characters.	
<b>Props</b>	The student used several props and showed considerable creativity.	The student used one or two appropriate props that made the presentation better.	The student used one or two props that made the presentation better.	The student used no props to make the presentation better.	
<b>Required Elements</b>	The student included more information than required.	The student included all required information.	The student included most required information.	The student included less information than required.	
				<b>Total</b>	



Name: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Period: \_\_\_\_\_

## Class Participation Rubric

	<b>Beginning</b> <b>1 point</b>	<b>Developing</b> <b>2 points</b>	<b>Accomplished</b> <b>3 points</b>	<b>Exemplary</b> <b>4 points</b>	<b>Score</b>
<b>Class discussions</b>	Rarely contributed to discussions of the class	Contributed good effort to discussions of the class	Contributed great effort to discussions of the class	Contributed exceptional effort to discussions of the class	
<b>On-task behavior</b>	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
<b>Helping others</b>	Did not assist other class members	Seldom assisted other class members	Occasionally assisted other class members	Assisted other class members	
<b>Listening</b>	Ignored ideas of class members	Seldom listened to ideas of class members	Occasionally listened to ideas of class members	Always listened to ideas of class members	
<b>TOTAL</b>					

# Business, Evaluation, and Development

## Unit 14: Business of Gaming

**Competency 1:** Explain the importance of audience knowledge and target marketing in game design technology.  
VG.D.74

### Suggested Enduring Understandings

1. It is important for students to understand how to market a product, such as a video game, to a particular population set.
2. It is important for students to know how video games are distributed.

### Suggested Essential Questions

1. What is marketing?
2. What is a target market?
3. How are video games distributed within the market?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss target markets and how to get a video game sold. (DOK 1)	<p>a. Explain target markets and the marketing tools used to sell products.  <small>CS1, CS2, CS7, CS8, CS9, CS15, T2, T3, T4</small></p> <p>Students will define the following terms:</p> <ul style="list-style-type: none"> <li>• Customer/Consumer</li> <li>• Target market</li> <li>• Marketing campaign</li> <li>• Direct marketing</li> <li>• Demographics</li> <li>• Unique selling point</li> <li>• Marketing effort</li> <li>• Pitch document</li> <li>• Point-of-purchase</li> <li>• Target rating</li> <li>• Competitive analysis</li> <li>• Hook</li> <li>• Risk analysis</li> <li>• Royalties</li> <li>• Globalization</li> <li>• Outsourcing <small>CS7, CS9, R4, T3, T6</small></li> </ul> <p>Students will create a Venn diagram that shows how a group of potential customers is smaller than the entire population. A marketing campaign should target the potential customer, not the rest of the population who will not or cannot buy the game.</p>	a. Participation Rubric  Rubric for Venn Diagram
b. Explain demographic segregation and how it can be used in a marketing campaign. DOK 2	<p>b. Describe demographic segregation and how it is used in a marketing campaign.  <small>CS1, CS2, CS7, CS8, CS9, CS15, M1, M3, M4, W1, W2, W3, W4, W5, T2, T3, T4</small></p> <p>Students will conduct a marketing survey of the career and technical center based on their game idea. Students will create a spreadsheet</p>	b. Presentation Rubric  Survey Rubric

	<p>that explains the details of their survey. The spreadsheet must include the population size, number of potential customers, and their projected target market.</p> <p>Further, students will need to define the demographic segregation that represents their game including age, income, and gender. Students will create a PowerPoint presentation that outlines their survey, target market, and demographic segregation and then present that to the class.</p>	
<p>c. Describe the marketing tools and how each can be used to attract buyers to a product. DOK 1</p>	<p>c. Explain the marketing tools. Ask the students to identify reasons why each marketing tool may be used in a marketing strategy. <sup>CS1, CS2, CS7, CS8, CS9, CS15, W2, W3, W4, W5, T2, T3, T4</sup></p> <p>The marketing tools include the following:</p> <ul style="list-style-type: none"> <li>• Television commercials</li> <li>• E-mail blasts (not spam)</li> <li>• Product Web site</li> <li>• Free trials or demos</li> <li>• Marketing brochures</li> <li>• Game packaging</li> <li>• Billboards</li> <li>• Screen savers</li> <li>• Booths at trade shows</li> </ul> <p>Students will construct a portfolio that includes all of the marketing tools that they plan to use for their game and how they will be used. Students should include artwork that represents each tool used. The portfolio should be uploaded into Blackboard where it will be reviewed by the student's peers.</p>	<p>c. Peer Evaluation Rubric</p>
<p>d. Compare and contrast the areas of the distribution process. (DOK 2)</p>	<p>d. Explain the different areas of distribution to include wholesale, retail, used game, rental game, and applications. <sup>CS1, CS2, CS7, CS8, CS9, CS15, T2, T3, T4</sup></p> <p>Students will create a chart that represents how video games are distributed.</p> <p>Students will create a PowerPoint presentation that compares and contrasts each of the distribution areas.</p>	<p>d. Presentation Rubric</p>

**Competency 2:** Research consumer behavior and publisher relations within the functions of marketing, such as advertising, public relations, sales, and promotions. <sup>VGD.74</sup>

**Suggested Enduring Understandings**

1. It is important for students to learn how consumer behavior can affect the functions of marketing, such as advertising, public relations, sales, and promotions.
2. It is important for students to learn how the company/publisher relationship can impact how games are brought to bear.

**Suggested Essential Questions**

1. How can consumer behavior affect a marketing campaign?
2. Why is customer support important to the success of a video game?
3. How can the relationship between the video game maker and publisher affect the marketing of a video game?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
<p>a. Explain consumer behavior and the influence it can have on the functions of marketing. (DOK 1)</p>	<p>a. Discuss consumer behavior and the effect on the functions of marketing. <sup>CS1, CS2, CS7, CS8, CS9, CS15, T2, T3, T4</sup></p> <p>Students will explain how consumers affect the functions of marketing.</p> <p>Students will research successful game companies and discuss the effective marketing strategies used to distinguish them among other game companies.</p>	<p>a. Participation Rubric</p>
<p>b. Discuss how game companies and publishers work together to bring a game to market. (DOK 1)</p>	<p>b. Explain the role of a publisher and how the relationship is critical for the success of a video game. <sup>CS1, CS2, CS7, CS8, CS9, CS15, E1, E2, W2, W3, W4, W5, T2, T3, T4</sup></p> <p>As a class, students will discuss the role of a publisher, the publisher’s responsibilities, and why it is important to have a good relationship with a publisher.</p> <p>Students will research and write a two-page report on publisher relationships of popular game companies.</p>	<p>b. Participation Rubric</p> <p>Report Rubric</p>
<p>c. Discuss contracts between game companies and publishers. (DOK 1)</p>	<p>c. Explain what contractual interactions and processes should be included in the procedures for a game company. <sup>CS1, CS2, CS7, CS8, CS9, CS15, E1, E2, W2, W3, W4, W5, T2, T3, T4</sup></p> <p>Students will research the procedures taken for acquiring publisher support and explain them to the class.</p> <p>Students will divide into groups and create and develop a contractual agreement between a video game company and a publisher.</p>	<p>c. Peer Evaluation Rubric</p> <p>Group Participation Rubric</p>

Students will evaluate each group's contract and identify missing or unnecessary information or regulations.

**Competency 3: Research and analyze the economics of the video game industry.** <sup>VG.D.73</sup>

**Suggested Enduring Understandings**

1. It is important for students to understand the economic principles related to the video game industry.
2. It is important that students realize the economic impact of the video game industry.

**Suggested Essential Questions**

1. How does money flow to and from the producer of a video game?
2. How do video games affect the overall economy?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Discuss the supply chain and how the economy is impacted. (DOK 1)	<p>a. Explain the supply chain and the basics of economics. <sup>CS1, CS2, CS7, CS8, CS9, CS15, T2, T3, T4</sup></p> <p>Students will define the following: <sup>CS7, CS9, R4, T3, T6</sup></p> <ul style="list-style-type: none"> <li>• Producer</li> <li>• Wholesaler</li> <li>• Developer</li> <li>• Supply</li> <li>• Demand</li> <li>• Profit</li> <li>• Overhead</li> <li>• Warehouses</li> <li>• Liquidate</li> </ul> <p>Students will watch the video <i>Microsoft's Big Games Gamble</i> and analyze the economic concepts presented.</p>	a. Participation Rubric
b. Investigate cost versus profit for video games. (DOK 2)	<p>b. Discuss the costs and profits involved in producing a video game. Explain how many people can benefit from a successful video game. <sup>CS1, CS2, CS7, CS8, CS9, CS15, M1, M3, M4, T2, T3, T4</sup></p> <p>Students will research the Internet and compare costs and profits of several video games. Students will construct a spreadsheet to analyze the numbers.</p> <p>The students will discuss major elements that had either a positive or negative economic impact on those games.</p>	<p>b. Spreadsheet Rubric</p> <p>Participation Rubric</p>
c. Analyze and predict costs and profits for video games. (DOK 2)	<p>c. Discuss economic predictors and how they can influence production decisions. <sup>CS1, CS2, CS7, CS8, CS9, CS15, M1, M3, M4, T2, T3, T4</sup></p> <p>Ask students what predictors may influence their game.</p>	<p>c. Spreadsheet Rubric</p> <p>Presentation Rubric</p> <p>Poster Rubric</p>

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Students will create a spreadsheet in Excel that will be used to predict the costs and profits involved in making, distributing, and selling their video game.

Students will then be given a scenario with an unpredictable outcome, such as a major distribution error or failure, and they will revise their projections.

Students will create a poster that presents the information. The poster will include predictors, cost and profit projections, before and after comparisons, decisions made, and an explanation of the economic impact to the consumer, the distributors, the retailers, and the game production company.

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# Standards

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## **IGDA Standards**

VG.D.73

VG.D.74

## **21st Century Learning Standards**

CS1 Global Awareness

CS2 Financial, Economic, Business, and Entrepreneurial Literacy

CS7 Critical Thinking and Problem Solving

CS8 Communication and Collaboration

CS9 Information Literacy

CS15 Productivity and Accountability

## **National Educational Technology Standards for Students**

T2 Communication and Collaboration

T3 Research and Information Fluency

T4 Critical Thinking, Problem Solving, and Decision Making

## **ACT College Readiness Standards**

E1 Topic Development in Terms of Purpose and Focus

E2 Organization, Unity, and Coherence

E3 Word Choice in Terms of Style, Tone, Clarity, and Economy

E4 Sentence Structure and Formation

E5 Conventions of Usage

E6 Conventions of Punctuation

M1 Basic Operations and Applications

M3 Numbers: Concepts and Properties

M4 Expressions, Equations, and Inequalities

R4 Meaning of Words

W1 Expressing Judgments

W2 Focusing on the Topic

W3 Developing a Position

W4 Organizing Ideas

## References

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Novak, J. (2008). *Game development essentials* (2nd ed.). Clifton Park, NY: Delmar Cengage Learning.

For additional references, activities, and Web resources, please refer to the Game Design and Development Technology P.A.C.E. Web site at <http://rcu.blackboard.com> (available only to registered users).



## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Participation Rubric

	<b>Beginning 1 point</b>	<b>Developing 2 points</b>	<b>Accomplished 3 points</b>	<b>Exemplary 4 points</b>	<b>Score</b>
<b>Group Discussions</b>	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
<b>On-Task Behavior</b>	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
<b>Helping Others</b>	Did not assist other group members	Seldom assisted other group members	Occasionally assisted other group members	Assisted other group members	
<b>Listening</b>	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
<b>Total Score</b>					

**Comments:**

## Unit 15: Simulation and Animation Design Seminar and Experience

**Competency 1:** Apply practical video game design mechanics, programming, visual and audio elements, and game production techniques while working in teams. (DOK2) VGD.07, VGD.09, VGD.15, VGD.30, VGD.40

### Suggested Enduring Understandings

1. It is important for students to understand how to create a video game for a client.
2. It is important for students to apply practical video game concepts and elements in the planning, creation, programming, and production of a video game.

### Suggested Essential Questions

1. What are the needs of the client, and how are they determined?
2. How are teams structured and assembled?
3. What are the steps taken to successfully produce a final product?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify the five phases of idea generation. (DOK1)	<p>a. Assign groups of four to five students, and review the game-making process to include all elements taught over the previous three semesters. <small>CS2, CS8, CS9, CS10, CS11, CS14, CS15, CS16, T1, T2, T3, T4, T6</small></p> <p>Students will meet with assigned groups and choose a group leader/producer. The group will also choose a storyteller, artist, animator, sound designer, and programmer.</p> <p>Directors will conduct meetings to discuss the five phases of group idea generation:</p> <ol style="list-style-type: none"> <li>1. Cranial exploration</li> <li>2. Prune and discuss</li> <li>3. Assign and conduct research</li> <li>4. Follow up</li> <li>5. Decide</li> </ol>	a. Participation Rubric
b. Conduct interviews with possible candidates and/or clients. (DOK2)	<p>b. Describe the process of interviewing candidates for the possibility of them becoming candidates for the making of a video game. Have the students determine the interview questions as a class. <small>CS2, CS8, CS14, CS15, CS16, T2, T4</small></p> <p>Every student will conduct an interview with an academic and/or vocational instructor, take notes, and choose an objective on which to build the game.</p>	b. Teacher observation  Graded interview
c. Create a "concept" for the video game. (DOK2)	<p>c. Explain the "concept" document (aka the proposal) and how it aids in the making of a video game. <small>CS9, CS15, E1, E2, E3, W1, W2, W4, T3, T4</small></p> <p>The students will create a concept (proposal) for the group that provides a rationale for choosing that subject and objective for the game. The</p>	c. Participation Rubric  Peer Evaluation Rubric

	<p>concept will address the four key questions:</p> <ol style="list-style-type: none"> <li>1. What is the game?</li> <li>2. Who will buy the game?</li> <li>3. Why will they buy the game?</li> <li>4. Why should this game be produced?</li> </ol> <p>Groups will choose one concept and create a storyboard while the storyteller creates the script.</p>	
d. Create a game inventory. (DOK1)	<p>d. Discuss the game design document (GDD) process and what is included, such as inventories, scripts, scene descriptions, and menu trees. <small>CS9, CS15, W1, W2, T3, T4</small></p> <p>Explain that every game has an inventory list of items that may be used immediately or saved for later use. The inventory will list the item, how it looks or sounds, usage, special equipment needed, degradation, capacity, special effects, and rarity.</p> <p>Students will create a game inventory based on the needs of their department. For example, the sound department will create special effects for the game, so the student will list the names of the sound effects, how they will be used, and how often they will be used.</p>	<p>d. Participation and teacher observation</p> <p>Inventory Rubric</p>
e. Create a menu tree. (DOK1)	<p>e. Explain the menu tree and its importance to the GDD. <small>CS9, CS15, T3, T4</small></p> <p>Students will create a menu tree that illustrates the transition from one menu to the next and the menu hierarchy.</p> <p>Groups will meet to merge the menu trees.</p>	e. Tree Rubric
f. Create a block diagram or chart that represents the elements to be created by specific departments. (DOK1)	<p>f. Explain how to create a block diagram. <small>CS9, CS15, T3, T4</small></p> <p>Students will create a block diagram or chart that represents the elements to be included in the game. The following are examples:</p> <ul style="list-style-type: none"> <li>• Art department students will use illustration software and draw characters.</li> <li>• Animation department students will use design visualization software and create the environment for the game.</li> <li>• Programming department students will create the coding structure and security policies for the game.</li> <li>• Sound department students will create several special effects, sounds, and music for the game.</li> </ul>	f. Diagram/Chart Rubric

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Groups will meet to choose the characters that will be used, the environment to be used, which sounds are to be used, and the user interface possibilities.

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g. Create a video game.  
DOK 4

g. Review the culmination of all aspects of video game creation and how the team works together to produce the final version. CS9, CS15, T3, T4, T6

Students will work as a team to create the video game. Art department students will create all the characters, scenes, items, and textures using the illustration software; programming department students will code the game engine; animation department students will create the characters, scenes, items, and textures using design visualization software; and sound department students will finalize sound effects and music for the game.

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g. Grades will be provided by the client, the students who ultimately play the game, peers, and the instructor.

# Standards

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## **IGDA Standards**

- VGD.07 Conceptual Game Design
- VGD.09 Practical Game Design
- VGD.15 Programming Teams: Structure and Working Relationships
- VGD.30 Motion Graphics
- VGD.40 Basic Studio Skills

## **21st Century Learning Standards**

- CS2 Financial, Economic, Business, and Entrepreneurial Literacy
- CS3 Civic Literacy
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy
- CS14 Social and Cross-Cultural Skills
- CS15 Productivity and Accountability
- CS16 Leadership and Responsibility

## **National Educational Technology Standards for Students**

- T1 Creativity and Innovation
- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T4 Critical Thinking, Problem Solving, and Decision Making
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- E3 Word Choice in Terms of Style, Tone, Clarity, and Economy
- W1 Expressing Judgments
- W2 Focusing on the Topic
- W4 Organizing Ideas

## References

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Hight, J., & Novak, J. (2008). *Game development essentials: Game project management*. Clifton Park, NY: Thomson/Delmar Learning.

Novak, J. (2008). *Game development essentials* (2nd ed.). Clifton Park, NY: Delmar Cengage Learning.

For additional references, activities, and Web resources, please refer to the Game Design and Development Technology P.A.C.E. Web site at <http://rcu.blackboard.com/> (available only to registered users).

## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Participation Rubric

	<b>Beginning 1 point</b>	<b>Developing 2 points</b>	<b>Accomplished 3 points</b>	<b>Exemplary 4 points</b>	<b>Score</b>
<b>Group Discussions</b>	Rarely contributed to discussions of the group	Contributed good effort to discussions of the group	Contributed great effort to discussions of the group	Contributed exceptional effort to discussions of the group	
<b>On-Task Behavior</b>	Exhibited on-task behavior inconsistently	Exhibited on-task behavior some of the time	Exhibited on-task behavior most of the time	Exhibited on-task behavior consistently	
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<b>Listening</b>	Ignored ideas of group members	Seldom listened to ideas of group members	Occasionally listened to ideas of group members	Always listened to ideas of group members	
<b>Total Score</b>					

**Comments:**

## Unit 16: Game Evaluation

**Competency 1:** Explore and understand video game architecture through testing, defect tracking, technical reviews, and inspections. (DOK2) <sup>VGD.69, VGD.70, VGD.71</sup>

### Suggested Enduring Understandings

1. It is important for students to understand how to find and track defects in video games.
2. It is important for students to know how to evaluate video games through testing, defect tracking, technical reviews, and inspections.

### Suggested Essential Questions

1. What is game architecture?
2. How are video games evaluated?
3. What types of tests are important in evaluating video games?

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify the elements of game architecture and the evaluation process. (DOK1)	<p>a. Explain game architecture and the evaluation process. <sup>CS6, CS8, CS9, CS10, CS11, CS15, CS16, T2, T3, T6</sup></p> <p>Students will define the following terms:</p> <ul style="list-style-type: none"> <li>• Game testing</li> <li>• Bug detection</li> <li>• Testing manager</li> <li>• Lead tester</li> <li>• Format tester</li> <li>• Focus tester</li> <li>• Playability</li> <li>• Bug classification</li> <li>• Bug fixing <sup>CS7, CS9, R4, T3, T6</sup></li> </ul> <p>Students will research the Internet to find the definitions associated with the above terms and key the terms and definitions in a word processing document.</p>	a. Grade definitions for accuracy.
b. Explain the process of bug testing. (DOK2)	<p>b. Describe the process of fixing bugs related to video games, and demonstrate online database software that creates bug reports. <sup>CS6, CS7, CS8, CS9, CS10, CS11, CS15, E1, E2, W2, W4, T2, T3, T6</sup></p> <p>Students will create a bug report that classifies video game bugs, how the bugs are to be reported, and who will carry out the debugging.</p>	<p>b. Teacher observation</p> <p>Graded report</p>
c. Explain bug fixing. (DOK2)	<p>c. Explain the bug fixing process, and give examples of a bug fixing chart. <sup>CS6, CS8, CS9, CS10, CS11, CS15, T2, T3, T6</sup></p> <p>The students will create a chart that demonstrates the bug fixing process.</p> <p>Students will play the game they created, identify the bugs, and create a bug report and bug fix chart.</p>	<p>c. Participation Rubric and graded chart</p> <p>Bug Reporting and Fix Chart</p>

Students will fix the bugs in their video game and generate a report and chart describing the process.

**Competency 2:** Critically evaluate game design, character development, character animation, sound design, playability, and compatibility. (DOK2) VG.D.62, VGD.70

**Suggested Enduring Understandings**

1. It is important for students to evaluate all aspects of video game creation including the game design, character development and animation, sound effects and music, and playability.
2. Being able to correct technical problems within a game is an important aspect to game design.

**Suggested Essential Questions**

1. Why is game evaluation and testing important?
2. How are corrections made to games with bugs or technical problems?

a. Classify the testing priority of elements of game design, character development and animation, sound design, playability, and compatibility. (DOK1)

a. Explain the elements of video game evaluation. CS6, CS7, CS8, CS9, CS10, CS11, CS15, CS16, T2, T3, T6  
  
Students will work in groups and develop a slide presentation that classifies the prioritization of game evaluation to include the game design, character development and animation, sound design, playability, and compatibility.

a. Presentation Rubric

b. Design and develop a video game evaluation plan. (DOK2)

b. Describe the process of designing an evaluation plan including the project schedule and change request form. CS6, CS7, CS8, CS9, CS10, CS11, CS15, CS16, W2, W4, T2, T3, T6

b. Portfolio Rubric

Students will create an evaluation portfolio that includes a project schedule, change request forms, task assignments, status report, milestones reached, and release date projections.

c. Demonstrate the process of correcting game problem areas and satisfying quality assurance requirements. (DOK2)

c. Discuss the process of correcting game problems and how quality assurance requirements may be met. CS6, CS7, CS8, CS9, CS10, CS11, CS15, CS16, T2, T3, T6

c. Peer Evaluation Rubric

Students will work in assigned groups to correct existing issues with the game they created, and peers will play the games and evaluate group success.

Corrections may be made to any or all of the following:

- Game design
- Character development
- Character animation
- Sound design
- Playability
- Compatibility

# Standards

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## **IGDA Standards**

- VG.D.62 Testing
- VG.D.69 Defect Tracking
- VG.D.70 Technical Reviews and Inspections
- VG.D.71 Architecture

## **21st Century Learning Standards**

- CS6 Creativity and Innovation
- CS7 Critical Thinking and Problem Solving
- CS8 Communication and Collaboration
- CS9 Information Literacy
- CS10 Media Literacy
- CS11 ICT Literacy
- CS15 Productivity and Accountability
- CS16 Leadership and Responsibility

## **National Educational Technology Standards for Students**

- T2 Communication and Collaboration
- T3 Research and Information Fluency
- T6 Technology Operations and Concepts

## **ACT College Readiness Standards**

- E1 Topic Development in Terms of Purpose and Focus
- E2 Organization, Unity, and Coherence
- R4 Meaning of Words
- R5 Generalizations and Conclusions
- W2 Focusing on the Topic
- W4 Organizing Ideas

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## Suggested Rubrics and Checklists

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

## Group Participation Rubric

	<b>Beginning 1 point</b>	<b>Developing 2 points</b>	<b>Accomplished 3 points</b>	<b>Exemplary 4 points</b>	<b>Score</b>
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<b>Total Score</b>					

**Comments:**

# Student Competency Profile

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**Student Name:** \_\_\_\_\_

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

## **Unit 1: Introduction, Safety, and Orientation**

- \_\_\_\_\_ 1. Identify course expectations, school policies, program policies, and safety procedures related to Simulation and Animation Design. (DOK 1)
- \_\_\_\_\_ 2. Explore personality development, leadership, and teamwork in relation to the classroom environment, interpersonal skills, and others. (DOK 1)

## **Unit 2: Ethics in the Game Design Industry**

- \_\_\_\_\_ 1. Research copyright rules, regulations, and issues related to graphics and images produced by others and original work, and adhere to those rules and regulations when developing work. (DOK 1)
- \_\_\_\_\_ 2. Research online content, and evaluate content bias, currency, and source. (DOK 1)
- \_\_\_\_\_ 3. Define and abide by the game designer's code of ethics. (DOK 1)

## **Unit 3: Games and Society**

- \_\_\_\_\_ 1. Understand how games reflect and construct individuals and groups. (DOK 1)
- \_\_\_\_\_ 2. Research and identify careers and roles within the game design and development industry. (DOK 2)
- \_\_\_\_\_ 3. Develop a professional portfolio.
- \_\_\_\_\_ 4. Discuss the future of video games. (DOK 1)

## **Unit 4: Game Design Theory and Mechanics**

- \_\_\_\_\_ 1. Identify the core components of game design theory and mechanics. (DOK 1)
- \_\_\_\_\_ 2. Understand the character creation process. (DOK 1)
- \_\_\_\_\_ 3. Apply design principles and techniques in the creation of a 2-D, digital, and 3-D character. (DOK 2)
- \_\_\_\_\_ 4. Understand the "rules of play" in game design technology. (DOK 1)
- \_\_\_\_\_ 5. Identify hardware and software related to the game design industry. (DOK 1)

## **Unit 5: Photography for Game Design**

- \_\_\_\_\_ 1. Demonstrate proficiency in the setup, operation, and troubleshooting of a graphic design computer. (DOK 1)
- \_\_\_\_\_ 2. Explain photography and graphic digital manipulation elements. (DOK 1)
- \_\_\_\_\_ 3. Complete a photography project that meets the needs of an audience. (DOK 2)
- \_\_\_\_\_ 4. Use photo editing software to create and edit a product for a customer. (DOK 2)

## **Unit 6: Artistic Rendering Using Illustration Software**

- \_\_\_\_\_ 1. Understand the elements of visual design in relation to game design. (DOK 1)



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2. Demonstrate the use of illustration software. (DOK 2)

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**Unit 7: Design Visualization Software Introduction**

1. Interact with the design visualization software effectively and productively with the user interface. (DOK 2)
2. Manage design visualization software file input and output. (DOK 2)

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**Unit 8: Geometry in Design Visualization Software**

1. Set an environment for working with design visualization software, and create objects using basic geometry. (DOK 1)
2. Design, create, and analyze the visual component of games. (DOK 2)

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**Unit 9: World Design Using Design Visualization Software**

1. Identify the fundamental architectural and structural principles of level design in relation to game environments. (DOK 1)
2. Create, manipulate, and analyze the visual components of the game world. (DOK 2)
3. Manipulate three-dimensional aspects of the world design by adjusting cameras and lighting and adding special effects. (DOK 2)

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**Unit 10: Character Development and Animation**

1. Develop an understanding of the principles and history of visual asset generation. (DOK 1)
2. Examine the process of developing visual assets. (DOK 1)

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**Unit 11: Audio Design**

1. Research audio history and theory. (DOK 1)
2. Understand the functions of audio design fundamentals (creating the atmosphere) and interactive audio for game design. (DOK 1)
3. Apply fundamentals of 3-D audio in order to blend video game audio elements. (DOK 2)

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**Unit 12: Video Game Programming**

1. Analyze the structure of the C++ language. (DOK 1)
2. Analyze the purpose, importance, and structure of game engines. (DOK 1)
3. Develop an understanding of computer networks as they relate to game design technology. (DOK 1)

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**Unit 13: Video Game Production**

1. Identify the company roles and team roles and responsibilities related to the game development process. (DOK 1)
2. Plan, create, interpret, and analyze budgets for game design and development. (DOK 2)
3. Apply time and project-management skills. (DOK 2)
4. Communicate with peers, supervisors, and subordinates. (DOK 2)
5. Discuss quality assurance and the role it plays in game design. (DOK 1)

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**Unit 14: Business of Gaming**

1. Explain the importance of audience knowledge and target marketing in game design technology.
  2. Research consumer behavior and publisher relations within the functions of marketing, such as advertising, public relations, sales, and promotions.
  3. Research and analyze the economics of the video game industry.
-

**Unit 15: Simulation and Animation Design Seminar and Experience**

1. Apply practical video game design mechanics, programming, visual and audio elements, and game production techniques while working in teams. (DOK 2)

**Unit 16: Game Evaluation**

1. Explore and understand video game architecture through testing, defect tracking, technical reviews, and inspections. (DOK 2)
2. Critically evaluate game design, character development, character animation, sound design, playability, and compatibility. (DOK 2)

# Appendix A: International Game Developers Association (IGDA) Standards

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## **CRITICAL GAME STUDIES - Criticism, analysis, and history of electronic and non-electronic games**

### **VGD.01. Game Criticism**

- VGD.01.01 Game studies – ludology, critical theory and research, critical vocabulary
- VGD.01.02 Experience-centered criticism (player-centered approach) – study of interactivity, function and uses of exploration in virtual worlds, creating player immersion
- VGD.01.03 Consumer-oriented criticism – game advertising, legislative and judicial impact on the game industry, analyzing and understanding the function and current state of the gaming press
- VGD.01.04 Genre analysis – how game genres are defined, history of genres
- VGD.01.05 Auteur studies – authorship issues, branding
- VGD.01.06 Analysis of game design – gameplay, narrative, story and plot, character development, art and sound design

### **VGD.02. Media Studies**

- VGD.02.01 Media research methods – data collection, ethnography, introduction to mass media, general game research
- VGD.02.02 Core experiences – game review, criticism

## **GAMES AND SOCIETY - Understanding how games reflect and construct individuals and groups as well as how games reflect and are constructed by individuals and groups**

### **VGD.03. Players and Effects**

- VGD.03.01 Gaming demographics – gender, diversity, child development, patterns of buyers and players, and game-related organizations
- VGD.03.02 The “cultures” of gaming – pop, fan, and mass culture

### **VGD.04. History**

### **VGD.05. Experience of Play**

- VGD.05.01 Historical aspects of the experience of play – history of play, cross-cultural anthropology of play, commonalities and difference of games across nationalities, role of the economy in history of play

- VGD.05.02 Social aspects – social games, “safe spaces,” effects of cheating, stereotypes, ethical and social issues in games
- VGD.05.03 Psychological aspects – theories of intelligence, cognitive theory, games, and violence/addiction
- VGD.05.04 Economic aspect – push for larger sales (more sequels of successful products), more licensed products), role of game quality and supply in the crash of the ‘80s, changing demographics, new opportunities
- VGD.05.05 Human/machine interaction – usability issues, accessibility issues

**VGD.06. Construction of Games and Game Technologies**

- VGD.06.01 Historical aspects of the technologies and institutions that frame the game industry – history of game technologies, game companies, video game litigation and patents
- VGD.06.02 Anthropology of the game industry – political and economic context of the game industry, practice of game development, cultural context of game development, game developer “culture,” the intersection of gamer culture and game producer culture, the transnational production of games and game technologies

**GAME DESIGN - Principles and methodologies behind the rules and play of games**

**VGD.07. Conceptual Game Design**

- VGD.07.01 Understanding the atomic parts of games – game objects (tokens) and game setting, rules, dynamics, play mechanics, goal(s), conflict, theme/color
- VGD.07.02 Play mechanics – game rules, core mechanics, game theory, balance in games
- VGD.07.03 Approaches to game design – algorithmic design, player experience approach, world design
- VGD.07.04 Board game and role-playing design – wargames, role-playing games, collectable card games, chance and probability, narrative, and flavor
- VGD.07.05 Ideas – turning ideas into concept, evaluating game concepts
- VGD.07.06 Fun – different kinds of fun, define fun
- VGD.07.07 Abstract design elements – positive and negative feedback systems, emergent complexity, simulation and emulation, communication systems
- VGD.07.08 Psychological design considerations – operant conditioning, flow states, addiction in gaming, rewards and penalties, difficulty curve, diverse social systems
- VGD.07.09 Interface design – theory, human–computer interaction, user task modeling
- VGD.07.10 Iterative nature of game design: create, test, change, and repeat

#### **VG.D.08. Serious Game Design**

VG.D.08.01 Uses of games in training, therapeutic and other non-entertainment applications, such as education, instructional design, political statements, artistic medium, and assessment

#### **VG.D.09. Practical Game Design**

VG.D.09.01 Spatial design – abstract spaces, pacing, narrative, interactive and responsive worlds, goal communication through game design

VG.D.09.02 Task design – action and interaction, puzzles, providing feedback to players

VG.D.09.03 Design integration – melding space and task, integrating art and gameplay

VG.D.09.04 Control schemes – direct/indirect interact manipulation, movement and navigation, item manipulation, inventories

VG.D.09.05 Custom tool use – getting design concepts into a game’s underlying system

VG.D.09.06 Training – teaching how to play the game, consistent challenges and appropriate feedback, keeping track of what players have done

VG.D.09.07 Game tuning – what makes a balanced game, understanding games as dynamic systems, balancing player advancement

VG.D.09.08 Game player analysis – understanding the audience, designing for diverse populations, quality assurance

VG.D.09.09 Play testing – theory, human–computer interaction, user task modeling

VG.D.09.10 Prototyping – creating physical prototypes for turn-based and real-time games, creating digital prototypes for individual systems, rapid prototyping

VG.D.09.11 Game design documentation – writing and maintaining game design document, writing concepts/proposals/rules documents, communicating design ideas, change tracking

VG.D.09.12 Content design – level design

#### **GAME PROGRAMMING - Aspects of traditional computer science and software engineering – modified to address the technical aspects of gaming**

#### **VG.D.10. Math and Science Techniques**

VG.D.10.01 Math – calculus, linear algebra, probability and statistics, geometry

VG.D.10.02 Science – physics, computational mechanics

#### **VG.D.11 Style and Design Principles**

VG.D.11.01 Coherency

VG.D.11.02 Object-oriented programming paradigms

VG.D.11.03 Design patterns – game design patterns

**VG.D.12 Information Design**

VG.D.12.01 Data structures – data architecture, file formats, data organization, data compression

VG.D.12.02 Asset pipelining

VG.D.12.03 Computational geometry

VG.D.12.04 Environmental models, spatial data structures

VG.D.12.05 Database

VG.D.12.06 Machine architecture

VG.D.12.07 Optimization (CPU and GPU)

VG.D.12.08 Embedded system development

VG.D.12.09 Configuration control and source control systems

VG.D.12.10 Software architecture

VG.D.12.11 Software engineering

**VG.D.13 Game Engine Design**

VG.D.13.01 Purpose and importance

VG.D.13.02 Architecture and design

VG.D.13.03 Data pipelines

VG.D.13.04 Methodologies and practices to create stand-alone gaming

VG.D.13.05 Generic and universal issues in programming for 3-D engines – graphics libraries, programming object and camera motions, collision detection, special effects

**VG.D.14 Prototyping**

VG.D.14.01 Tools and skills for fast, iterative development

VG.D.14.02 Building flexible systems, configurable by others

**VG.D.15 Programming Teams - Structure and Working Relationships**

VG.D.15.01 Working in interdisciplinary teams

VG.D.15.02 Talking with programmers/artists/designers/producers

- VG.D.15.03 Team programming processes and methodologies
- VG.D.16 Design/Technology Synthesis**
  - VG.D.16.01 Supporting player goals and actions
  - VG.D.16.02 Building intelligent, coherent, consistent, reactive game environments
  - VG.D.16.03 Platform issues
- VG.D.17 System Architecture for Real-Time Game Environments and Simulations**
  - VG.D.17.01 Concurrent programming techniques
  - VG.D.17.02 Integration of subsystems (physics, collision detection, AI, input, render, scripting)
  - VG.D.17.03 Incorporating and extending third-party systems in a game engine
  - VG.D.17.04 Resource budgeting (CPU, GPU, memory)
- VG.D.18 Computer Architecture**
  - VG.D.18.01 Structure of a CPU with implications to program design (e.g., avoiding branching)
  - VG.D.18.02 The memory hierarchy with implications to program design (e.g., alignment of data structures in memory, locality of reference)
  - VG.D.18.03 Algorithm design considerations for CPU versus GPU implementation
- VG.D.19 Tools Construction**
  - VG.D.19.01 “Tool development”
  - VG.D.19.02 GUI creation
  - VG.D.19.03 Tools for multimedia content creation, modification, and management
  - VG.D.19.04 Custom design tools
  - VG.D.19.05 Building flexible systems for non-programmers to use
- VG.D.20 Graphics Programming**
  - VG.D.20.01 Rendering – transforms lighting, texturing, clipping, occlusions, transparency, level of detail considerations, using data structures to optimize rendering time
  - VG.D.20.02 Animation – forward and inverse kinematics, transform representations, interpolation, techniques, camera animation
  - VG.D.20.03 Graphics system design
  - VG.D.20.04 Procedural content generation (textures, models, etc.)

**VG.D.21 Sound/Audio Programming**

- VG.D.21.01 Physics of sound and human hearing
- VG.D.21.02 Programming 3-D positional sound
- VG.D.21.03 Utilizing audio channels
- VG.D.21.04 Audio prioritization

**VG.D.22 Artificial intelligence**

- VG.D.22.01 Difference in goals between game AI and traditional AI
- VG.D.22.02 Path planning, search algorithms
- VG.D.22.03 Agent architectures
- VG.D.22.04 Decision-making systems
- VG.D.22.05 State machine design
- VG.D.22.06 Statistical machine learning

**VG.D.23 Networks**

- VG.D.23.01 Networking and server design
- VG.D.23.02 Performance metrics
- VG.D.23.03 Topologies
- VG.D.23.04 Protocols – TCP/IP, UDP, and so forth
- VG.D.23.05 Security
- VG.D.23.06 Game servers
- VG.D.23.07 Game protocol development
- VG.D.23.08 Available network libraries
- VG.D.23.09 Open source network game case studies

**VG.D.24 Game Logic**

- VG.D.24.01 Compilers
- VG.D.24.02 Scripting languages

**VG.D.25 Play Analysis**

- VG.D.25.01 Play testing to monitor player frustration, progress, and enjoyment



VGD.25.02 Monitoring player state – gameplay data logging

VGD.25.03 Player metrics

**VISUAL DESIGN - Designing, creating, and analyzing the visual components of games**

**VGD.26 Basic Visual Design**

VGD.26.01 Art history and theory

VGD.26.02 Visual design fundamentals – composition, lighting and color, graphic design, and typography

VGD.26.03 Fundamentals of drawing

VGD.26.04 Painting techniques

VGD.26.05 Sculpting

VGD.26.06 Anatomy and life drawing

VGD.26.07 Physiology and kinesiology

**VGD.27 Non-Narrative Graphics/Abstraction as Expressive Tool**

**VGD.28 Visual Design in an Interactive Context**

**VGD.29 Visual Narratives: Painting, Comics, Photography, Film**

**VGD.30 Motion Graphics**

VGD.30.01 Animation

VGD.30.02 Cinematography

VGD.30.03 Camera angles and framing

VGD.30.04 Visual narrative/storyboarding

VGD.30.05 Filmmaking: framing, types of shots and camera movement, editing

VGD.30.06 Kinematics

**VGD.31 Visual Asset Generation**

VGD.31.01 2-D graphics – pixel art

VGD.31.02 3-D modeling

VGD.31.03 Textures

VGD.31.04 Interface design

VGD.31.05 Character design – conceptual design, character modeling, character animation

**VGD.32 World Design**

VGD.32.01 Environmental modeling

**VGD.33 Architecture**

VGD.33.01 Fundamental principles of architecture

VGD.33.02 History of architecture

VGD.33.03 Fundamental principles of architecture

VGD.33.04 Real-world spaces versus game spaces

VGD.33.05 Space design

VGD.33.06 Navigation

VGD.33.07 Materials

**VGD.34 Working with 3-D Hardware**

VGD.34.01 Procedural shading

VGD.34.02 Lighting

VGD.34.03 Effects

**VGD.35 Game Art (digital-based art with game content)**

VGD.35.01 Custom tool use – getting game art into a game’s engine

**VGD.36 Information Visualization**

**VGD.37 Procedural Content**

**AUDIO DESIGN - Designing and creating sound and sound environments**

**VGD.38 Audio History and Theory**

**VGD.39 Basic Technical Skills**

**VGD.40 Basic Studio Skills**

VGD.40.01 Familiarity with hardware and software (e.g., microphones, mixers, outboard gear)

VGD.40.02 Recording, mixing, and mastering

VGD.40.03 Studio organization

**VG.D.41 Audio Programming**

**VG.D.42 Audio Assets**

**VG.D.43 Audio Tools**

**VG.D.44 Audio Design Fundamentals**

VG.D.44.01 Setting mood, managing tension and resolution

VG.D.44.02 Processing, mixing, and controlling sound for aesthetic effect

VG.D.44.03 General work flow for game creation

VG.D.44.04 Audio engine terminology and functionality

**VG.D.45 Introduction to Interactive Audio**

VG.D.45.01 Designing sound for interactivity

VG.D.45.02 Sound effects

VG.D.45.03 Music

VG.D.45.04 Voice recording

**VG.D.46 Sound Effects**

VG.D.46.01 Simulation of sound environments

VG.D.46.02 Ambience versus musicality in soundtracks

**VG.D.47 Music**

VG.D.47.01 Composition

VG.D.47.02 Interactive scoring

**VG.D.48 3-D Audio**

VG.D.48.01 Fundamentals of 3-D and multi-channel sound

VG.D.48.02 Modeling for effects, echo, room size simulation

**INTERACTIVE STORYTELLING - Traditional storytelling and the challenges of interactive narrative**

**VG.D.49 Story in Non-Interactive Media**

VG.D.49.01 Literary theory and narratology – traditional narrative “act” structure, thinking abstractly and concretely about “story,” traditional narratives (folktales), structuralism/narratology, post-structuralism, postmodern literature

- VG.D.49.02 Theatre – performance theory, theorists: Aristotle, Brecht, Artaud, Boal, and so forth
- VG.D.49.03 Story creation – setting: time, place, character actions/motivations/dialogue, events
- VG.D.49.04 Discourse – style, voice and point of view, event structure
- VG.D.49.05 Characterization in fiction, film, and theatre
- VG.D.49.06 Introduction to film and literary theory
- VG.D.49.07 Theories of game and narrative
- VG.D.49.08 Context setting versus traditional storytelling
- VG.D.49.09 Back-story and fictional setting design
- VG.D.49.10 Creating compelling characters

**VG.D.50 Narrative in Interactive Media**

- VG.D.50.01 Theoretical issues – agency, immersion, interactivity versus narrative, cybertext, algorithmic storytelling and process intensity, cohesion, and “well-formed” narrative
- VG.D.50.02 Interactive story in non-computer-based media – role-playing games; oral storytelling; literary examples—Oulipo, Nabakov’s Pale Fire, and so forth; theatre examples—forum theatre, theatre of the oppressed, and so forth
- VG.D.50.03 Alternating fixed story with interactive game – visual novels (Japanese genre)
- VG.D.50.04 Exploratory narratives – hypertext
- VG.D.50.05 Branching trees: branching narrative, branching dialogue
- VG.D.50.06 Emergent narrative approaches – story generators
- VG.D.50.07 Interactive fiction
- VG.D.50.08 Collaborative storytelling – Web-based collaborative stories, alternative reality games, MUDs, MMOGs

**VG.D.51 Writing for Other Media**

- VG.D.51.01 Fiction writing
- VG.D.51.02 Dramatic writing – screenwriting, playwriting, writing for the radio

**VG.D.52 Abstract Audiovisual Narrative**

- VG.D.52.01 Semiotics and symbology
- VG.D.52.02 Creating mood and drama with music and sound

## **GAME PRODUCTION - Practical challenges of managing the development of games**

### **VG.D.53 People Management and Collaborative Development**

### **VG.D.54 Budgeting a Development Project**

### **VG.D.55 Where to Find Industry Standard Information – trades, trades from different parts of the industry, other media trades**

### **VG.D.56 Typical Budgets and Budget Categories**

### **VG.D.57 Team Makeup**

- VG.D.57.01 Job descriptions
- VG.D.57.02 Recruiting, training
- VG.D.57.03 Balancing talent, experience, budget

### **VG.D.58 The Game Development Lifecycle**

- VG.D.58.01 Pre-production/Production/Testing
- VG.D.58.02 Shipping and maintaining customer loyalty
- VG.D.58.03 Different approaches to production process – waterfall/spiral/v-shaped/evolutionary, scrum/agile, iterative/incremental, development, rapid prototyping, and so forth; strengths and weaknesses; issues specific to game development

### **VG.D.59 Work flow**

- VG.D.59.01 Knowing which tools to use and when
- VG.D.59.02 Evaluating and using computer-supported collaborative work tools – bug-tracking systems, wikis, spreadsheets, message boards/forums, databases, version-control
- VG.D.59.03 Problem evaluation and investing appropriate resources
- VG.D.59.04 Task breakdown – creating a backlog, dropping features

### **VG.D.60 Group Dynamics**

- VG.D.60.01 Team building
- VG.D.60.02 Establishing clear roles and clear goals
- VG.D.60.03 Realities of development teams
- VG.D.60.04 Building effective teams – working as a team to realize a unified gameplay vision, leadership, delegation and responsibility, defining the interfaces between team members

## **VG.D.61 Design and Development Documentation**

- VG.D.61.01 Why document?
- VG.D.61.02 What should you document?
- VG.D.61.03 How much documentation is enough/too much?
- VG.D.61.04 Who is the audience for the documentation?
- VG.D.61.05 To storyboard or not to storyboard?
- VG.D.61.06 Non-text-based documentation: using prototypes, physical models, pictures
- VG.D.61.07 Design and development documents – concept document/proposal, game specifications, design document, story bible, script, art bible, storyboards, technical design document, schedules and business/marketing documents, test plan

## **VG.D.62 Testing**

- VG.D.62.01 Code review and test harnesses
- VG.D.62.02 Designing tests and incorporating feedback from quality assurance
- VG.D.62.03 Bug fixing, bug databases, creating stable code bases

## **VG.D.63 Scheduling and Time Management**

- VG.D.63.01 Creating a schedule
- VG.D.63.02 Goals of a schedule – milestones
- VG.D.63.03 Balancing quality and reality
- VG.D.63.04 Working with a schedule, using it to help you ship
- VG.D.63.05 Typical schedules
- VG.D.63.06 Crunch-time issues
- VG.D.63.07 Quality of life issues

## **VG.D.64 Communication Skills**

- VG.D.64.01 Rhetoric
- VG.D.64.02 Communicating with peers, supervisors, and subordinates – communicating clearly in print and in speech, collaboration skills, speaking the same language/speaking across disciplinary divides

**VG.D.65 Coordinating the Efforts of Development, Quality Assurance, Sales, Marketing, Public Relations, and Finance**

**VG.D.66 Localization Issues, Processes, and Skills**

VG.D.66.01 Writing “around” the game – packaging, player manuals, Web sites, and so forth

**VG.D.67 Product Post-Mortems**

VG.D.67.01 Evaluating decisions, after-the-fact design decisions, process decisions, business decisions

**VG.D.68 Quality Assurance**

VG.D.68.01 Planning and quality assurance plans

**VG.D.69 Defect Tracking**

**VG.D.70 Technical Reviews and Inspections**

**VG.D.71 Architecture**

VG.D.71.01 Software testing – beta testing, system testing, code review and test harnesses, designing tests and incorporating feedback from quality assurance, bug fixing, bug databases, creating stable code bases

VG.D.71.02 Game testing

**VG.D.72 Working with Marketing**

VG.D.72.01 Marketing plans and schedules

VG.D.72.02 Marketing asset needs

**BUSINESS OF GAMING - Economic, legal, and policy aspects of games**

**VG.D.73 Game Industry Economics**

VG.D.73.01 Retailers, shelf-space, digital distribution: how audiences currently reach the games

VG.D.73.02 Platform choices – the tradeoffs of developing for consoles, PCs, and handheld mobile devices

VG.D.73.03 Internationalization/globalization of development – off-shoring/outsourcing, changing barriers to entry (knowledge, technology, labor), challenges of cultures, distance, time zones

VG.D.73.04 Distribution channels

VG.D.73.05 Microtransactions, one-time payment, software as a service with monthly payments, free to play with some features available to paying members, and so forth

- VG.D.73.06 Real money transactions in virtual worlds and MMOs
  - VG.D.73.07 Different delivery method and revenue streams (MS Arcade, PS Home, etc.)
  - VG.D.73.08 Independent versus publisher/developer game development
  - VG.D.73.09 Piracy
- VG.D.74 Audience**
- VG.D.74.01 Marketing and sales: how games currently reach an audience
  - VG.D.74.02 Understanding audiences for different game genres
  - VG.D.74.03 How to reach and keep given audiences
  - VG.D.74.04 Consumer behavior and psychology (what do consumers of various sorts and various populations want?)
- VG.D.75 Publisher/Developer Relationships**
- VG.D.75.01 The deal – what it covers, how it gets done, what it is likely to say, green-lighting process
  - VG.D.75.02 Day to day: once signed up, what interactions and processes occur
  - VG.D.75.03 Milestone review
- VG.D.76 Intellectual Property**
- VG.D.76.01 Technology and copyright – key cases, major players
  - VG.D.76.02 Content
  - VG.D.76.03 Licenses – acquisition of licenses, use of licenses, working with licensors
  - VG.D.76.04 Piracy
- VG.D.77 Patents and the Game Industry**
- VG.D.78 Contracts**
- VG.D.78.01 Publisher/developer
  - VG.D.78.02 Employer/employee
  - VG.D.78.03 Contractors
- VG.D.79 Content Regulation**
- VG.D.79.01 Game ratings and classification – ESRB (North America), PEGI (Europe), CERO (Japan)
  - VG.D.79.02 Government regulation – North America, Europe/Oceania, Asia



## Appendix B: 21st Century Skills Standards

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- CS1 Flexibility and Adaptability
- CS2 Initiative and Self-Direction
- CS3 Social and Cross-Cultural Skills
- CS4 Productivity and Accountability
- CS5 Leadership and Responsibility

Today's life and work environments require far more than thinking skills and content knowledge. The ability to navigate the complex life and work environments in the globally competitive information age requires students to pay rigorous attention to developing adequate life and career skills.

### **CS 1 Flexibility and Adaptability**

- Adapting to varied roles and responsibilities
- Working effectively in a climate of ambiguity and changing priorities

### **CS 2 Initiative and Self-Direction**

- Monitoring one's own understanding and learning needs
- Going beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise
- Demonstrating initiative to advance skill levels toward a professional level
- Defining, prioritizing, and completing tasks without direct oversight
- Utilizing time efficiently and managing workload
- Demonstrating commitment to learning as a lifelong process

### **CS 3 Social and Cross-Cultural Skills**

- Working appropriately and productively with others
- Leveraging the collective intelligence of groups when appropriate
- Bridging cultural differences and using differing perspectives to increase innovation and the quality of work

### **CS 4 Productivity and Accountability**

- Setting and meeting high standards and goals for delivering quality work on time
- Demonstrating diligence and a positive work ethic (e.g., being punctual and reliable)

### **CS 5 Leadership and Responsibility**

- Using interpersonal and problem-solving skills to influence and guide others toward a goal
- Leveraging strengths of others to accomplish a common goal
- Demonstrating integrity and ethical behavior
- Acting responsibly with the interests of the larger community in mind

# Appendix C: ACT College Readiness Standards

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## English

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### E1 Topic Development in Terms of Purpose and Focus

- Identify the basic purpose or role of a specified phrase or sentence.
- Delete a clause or sentence because it is obviously irrelevant to the essay.
- Identify the central idea or main topic of a straightforward piece of writing.
- Determine relevancy when presented with a variety of sentence-level details.
- Identify the focus of a simple essay, applying that knowledge to add a sentence that sharpens that focus or to determine if an essay has met a specified goal.
- Delete material primarily because it disturbs the flow and development of the paragraph.
- Add a sentence to accomplish a fairly straightforward purpose such as illustrating a given statement.
- Apply an awareness of the focus and purpose of a fairly involved essay to determine the rhetorical effect and suitability of an existing phrase or sentence or to determine the need to delete plausible but irrelevant material.
- Add a sentence to accomplish a subtle rhetorical purpose such as to emphasize, to add supporting detail, or to express meaning through connotation.
- Determine whether a complex essay has accomplished a specific purpose.
- Add a phrase or sentence to accomplish a complex purpose, often expressed in terms of the main focus of the essay.

### E2 Organization, Unity, and Coherence

- Use conjunctive adverbs or phrases to show time relationship in simple narrative essays (e.g., *then, this time, etc.*).
- Select the most logical place to add a sentence in a paragraph.
- Use conjunctive adverbs or phrases to express straightforward logical relationships (e.g., *first, afterward, in response*).
- Decide the most logical place to add a sentence in an essay.
- Add a sentence that introduces a simple paragraph.
- Determine the need for conjunctive adverbs or phrases to create subtle logical connections between sentences (e.g., *therefore, however, in addition*).
- Rearrange the sentences in a fairly uncomplicated paragraph for the sake of logic.
- Add a sentence to introduce or conclude the essay or to provide a transition between paragraphs when the essay is fairly straightforward.
- Make sophisticated distinctions concerning the logical use of conjunctive adverbs or phrases, particularly when signaling a shift between paragraphs.
- Rearrange sentences to improve the logic and coherence of a complex paragraph.
- Add a sentence to introduce or conclude a fairly complex paragraph.
- Consider the need for introductory sentences or transitions, basing decisions on a thorough understanding of both the logic and rhetorical effect of the paragraph and essay.

### E3 Word Choice in Terms of Style, Tone, Clarity, and Economy

- Revise sentences to correct awkward and confusing arrangements of sentence elements.
- Revise vague nouns and pronouns that create obvious logic problems.
- Delete obviously synonymous and wordy material in a sentence.
- Revise expressions that deviate from the style of an essay.
- Delete redundant material when information is repeated in different parts of speech (e.g., *alarmingly startled*).

- Use the word or phrase most consistent with the style and tone of a fairly straightforward essay.
- Determine the clearest and most logical conjunction to link clauses.
- Revise a phrase that is redundant in terms of the meaning and logic of the entire sentence.
- Identify and correct ambiguous pronoun references.
- Use the word or phrase most appropriate in terms of the content of the sentence and tone of the essay.
- Correct redundant material that involves sophisticated vocabulary and sounds acceptable as conversational English (e.g., an aesthetic viewpoint versus the outlook of an aesthetic viewpoint).
- Correct vague and wordy or clumsy and confusing writing containing sophisticated language.
- Delete redundant material that involves subtle concepts or that is redundant in terms of the paragraph as a whole.

#### **E4 Sentence Structure and Formation**

- Use conjunctions or punctuation to join simple clauses.
- Revise shifts in verb tense between simple clauses in a sentence or between simple adjoining sentences.
- Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences.
- Decide the appropriate verb tense and voice by considering the meaning of the entire sentence.
- Recognize and correct marked disturbances of sentence flow and structure (e.g., participial phrase fragments, missing or incorrect relative pronouns, dangling or misplaced modifiers).
- Revise to avoid faulty placement of phrases and faulty coordination and subordination of clauses in sentences with subtle structural problems.
- Maintain consistent verb tense and pronoun person on the basis of the preceding clause or sentence.
- Use sentence-combining techniques, effectively avoiding problematic comma splices, run-on sentences, and sentence fragments, especially in sentences containing compound subjects or verbs.
- Maintain a consistent and logical use of verb tense and pronoun person on the basis of information in the paragraph or essay as a whole.
- Work comfortably with long sentences and complex clausal relationships within sentences, avoiding weak conjunctions between independent clauses and maintaining parallel structure between clauses.

#### **E5 Conventions of Usage**

- Solve such basic grammatical problems as how to form the past and past participle of irregular but commonly used verbs and how to form comparative and superlative adjectives.
- Solve such grammatical problems as whether to use an adverb or adjective form, how to ensure straightforward subject–verb and pronoun–antecedent agreement, and which preposition to use in simple contexts.
- Recognize and use the appropriate word in frequently confused pairs such as there and their, past and passed, and led and lead.
- Use idiomatically appropriate prepositions, especially in combination with verbs (e.g., long for, appeal to).
- Ensure that a verb agrees with its subject when there is some text between the two.
- Ensure that a pronoun agrees with its antecedent when the two occur in separate clauses or sentences.
- Identify the correct past and past participle forms of irregular and infrequently used verbs and form present-perfect verbs by using have rather than of.
- Correctly use reflexive pronouns, the possessive pronouns its and your, and the relative pronouns who and whom.
- Ensure that a verb agrees with its subject in unusual situations (e.g., when the subject–verb order is inverted or when the subject is an indefinite pronoun).
- Provide idiomatically and contextually appropriate prepositions following verbs in situations involving sophisticated language or ideas.
- Ensure that a verb agrees with its subject when a phrase or clause between the two suggests a different number for the verb.

## **E6 Conventions of Punctuation**

- Delete commas that create basic sense problems (e.g., between verb and direct object).
- Provide appropriate punctuation in straightforward situations (e.g., items in a series).
- Delete commas that disturb the sentence flow (e.g., between modifier and modified element).
- Use commas to set off simple parenthetical phrases.
- Delete unnecessary commas when an incorrect reading of the sentence suggests a pause that should be punctuated (e.g., between verb and direct object clause).
- Use punctuation to set off complex parenthetical phrases.
- Recognize and delete unnecessary commas based on a careful reading of a complicated sentence (e.g., between the elements of a compound subject or compound verb joined by and).
- Use apostrophes to indicate simple possessive nouns.
- Recognize inappropriate uses of colons and semicolons.
- Use commas to set off a nonessential/ nonrestrictive appositive or clause.
- Deal with multiple punctuation problems (e.g., compound sentences containing unnecessary commas and phrases that may or may not be parenthetical).
- Use an apostrophe to show possession, especially with irregular plural nouns.
- Use a semicolon to indicate a relationship between closely related independent clauses.
- Use a colon to introduce an example or an elaboration.

## **Math**

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### **M1 Basic Operations and Applications**

- Perform one-operation computation with whole numbers and decimals.
- Solve problems in one or two steps using whole numbers.
- Perform common conversions (e.g., inches to feet or hours to minutes).
- Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent.
- Solve some routine two-step arithmetic problems.
- Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average.
- Solve multistep arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour).
- Solve word problems containing several rates, proportions, or percentages.
- Solve complex arithmetic problems involving percent of increase or decrease and problems requiring integration of several concepts from pre-algebra and/or pre-geometry (e.g., comparing percentages or averages, using several ratios, and finding ratios in geometry settings).

### **M2 Probability, Statistics, and Data Analysis**

- Calculate the average of a list of positive whole numbers.
- Perform a single computation using information from a table or chart.
- Calculate the average of a list of numbers.
- Calculate the average, given the number of data values and the sum of the data values.
- Read tables and graphs.
- Perform computations on data from tables and graphs.
- Use the relationship between the probability of an event and the probability of its complement.
- Calculate the missing data value, given the average and all data values but one.
- Translate from one representation of data to another (e.g., a bar graph to a circle graph).
- Determine the probability of a simple event.
- Exhibit knowledge of simple counting techniques\*.
- Calculate the average, given the frequency counts of all the data values.
- Manipulate data from tables and graphs.

- Compute straightforward probabilities for common situations.
- Use Venn diagrams in counting.\*
- Calculate or use a weighted average.
- Interpret and use information from figures, tables, and graphs.
- Apply counting techniques.
- Compute a probability when the event and/or sample space are not given or obvious.
- Distinguish between mean, median, and mode for a list of numbers.
- Analyze and draw conclusions based on information from figures, tables, and graphs.
- Exhibit knowledge of conditional and joint probability.

### **M3 Numbers: Concepts and Properties**

- Recognize equivalent fractions and fractions in lowest terms.
- Recognize one-digit factors of a number.
- Identify a digit's place value.
- Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor.
- Find and use the least common multiple.
- Order fractions.
- Work with numerical factors.
- Work with scientific notation.
- Work with squares and square roots of numbers.
- Work problems involving positive integer exponents.\*
- Work with cubes and cube roots of numbers.\*
- Determine when an expression is undefined.\*
- Exhibit some knowledge of the complex numbers.†
- Apply number properties involving prime factorization.
- Apply number properties involving even/odd numbers and factors/multiples.
- Apply number properties involving positive/negative numbers.
- Apply rules of exponents.
- Multiply two complex numbers.†
- Draw conclusions based on number concepts, algebraic properties, and/or relationships between expressions and numbers.
- Exhibit knowledge of logarithms and geometric sequences.
- Apply properties of complex numbers.

### **M4 Expressions, Equations, and Inequalities**

- Exhibit knowledge of basic expressions (e.g., identify an expression for a total as  $b + g$ ).
- Solve equations in the form  $x + a = b$ , where  $a$  and  $b$  are whole numbers or decimals.
- Substitute whole numbers for unknown quantities to evaluate expressions.
- Solve one-step equations having integer or decimal answers.
- Combine like terms (e.g.,  $2x + 5x$ ).
- Evaluate algebraic expressions by substituting integers for unknown quantities.
- Add and subtract simple algebraic expressions.
- Solve routine first-degree equations.
- Perform straightforward word-to-symbol translations.
- Multiply two binomials.\*
- Solve real-world problems using first-degree equations.
- Write expressions, equations, or inequalities with a single variable for common pre-algebra settings (e.g., rate and distance problems and problems that can be solved by using proportions).
- Identify solutions to simple quadratic equations.
- Add, subtract, and multiply polynomials.\*

- Factor simple quadratics (e.g., the difference of squares and perfect square trinomials).\*
- Solve first-degree inequalities that do not require reversing the inequality sign.\*
- Manipulate expressions and equations.
- Write expressions, equations, and inequalities for common algebra settings.
- Solve linear inequalities that require reversing the inequality sign.
- Solve absolute value equations.
- Solve quadratic equations.
- Find solutions to systems of linear equations.
- Write expressions that require planning and/or manipulating to accurately model a situation.
- Write equations and inequalities that require planning, manipulating, and/or solving.
- Solve simple absolute value inequalities.

#### **M5 Graphical Representations**

- Identify the location of a point with a positive coordinate on the number line.
- Locate points on the number line and in the first quadrant.
- Locate points in the coordinate plane.
- Comprehend the concept of length on the number line.\*
- Exhibit knowledge of slope.\*
- Identify the graph of a linear inequality on the number line.\*
- Determine the slope of a line from points or equations.\*
- Match linear graphs with their equations.\*
- Find the midpoint of a line segment.\*
- Interpret and use information from graphs in the coordinate plane.
- Match number line graphs with solution sets of linear inequalities.
- Use the distance formula.
- Use properties of parallel and perpendicular lines to determine an equation of a line or coordinates of a point.
- Recognize special characteristics of parabolas and circles (e.g., the vertex of a parabola and the center or radius of a circle).†
- Match number line graphs with solution sets of simple quadratic inequalities.
- Identify characteristics of graphs based on a set of conditions or on a general equation such as  $y = ax^2 + c$ .
- Solve problems integrating multiple algebraic and/or geometric concepts.
- Analyze and draw conclusions based on information from graphs in the coordinate plane.

#### **M6 Properties of Plane Figures**

- Exhibit some knowledge of the angles associated with parallel lines.
- Find the measure of an angle using properties of parallel lines.
- Exhibit knowledge of basic angle properties and special sums of angle measures (e.g.,  $90^\circ$ ,  $180^\circ$ , and  $360^\circ$ ).
- Use several angle properties to find an unknown angle measure.
- Recognize Pythagorean triples.\*
- Use properties of isosceles triangles.\*
- Apply properties of  $30^\circ$ - $60^\circ$ - $90^\circ$ ,  $45^\circ$ - $45^\circ$ - $90^\circ$ , similar, and congruent triangles.
- Use the Pythagorean theorem.
- Draw conclusions based on a set of conditions.
- Solve multistep geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas.
- Use relationships among angles, arcs, and distances in a circle.

#### **M7 Measurement**

- Estimate or calculate the length of a line segment based on other lengths given on a geometric figure.
- Compute the perimeter of polygons when all side lengths are given.

- Compute the area of rectangles when whole number dimensions are given.
- Compute the area and perimeter of triangles and rectangles in simple problems.
- Use geometric formulas when all necessary information is given.
- Compute the area of triangles and rectangles when one or more additional simple steps are required.
- Compute the area and circumference of circles after identifying necessary information.
- Compute the perimeter of simple composite geometric figures with unknown side lengths.\*
- Use relationships involving area, perimeter, and volume of geometric figures to compute another measure.
- Use scale factors to determine the magnitude of a size change.
- Compute the area of composite geometric figures when planning or visualization is required.

### **M8 Functions**

- Evaluate quadratic functions, expressed in function notation, at integer values.
- Evaluate polynomial functions, expressed in function notation, at integer values.†
- Express the sine, cosine, and tangent of an angle in a right triangle as a ratio of given side lengths.†
- Evaluate composite functions at integer values.†
- Apply basic trigonometric ratios to solve right-triangle problems.†
- Write an expression for the composite of two simple functions.†
- Use trigonometric concepts and basic identities to solve problems.†
- Exhibit knowledge of unit circle trigonometry.†
- Match graphs of basic trigonometric functions with their equations.

### **Notes:**

- Students who score in the 1–12 range are most likely beginning to develop the knowledge and skills assessed in the other ranges.
- Standards followed by an asterisk (\*) apply to the PLAN and ACT Mathematics Tests only.
- Standards followed by a dagger (†) apply to the ACT Mathematics Test only.

## **Reading**

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### **R1 Main Ideas and Author’s Approach**

- Recognize a clear intent of an author or narrator in uncomplicated literary narratives.
- Identify a clear main idea or purpose of straightforward paragraphs in uncomplicated literary narratives.
- Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives.
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in uncomplicated passages.
- Identify a clear main idea or purpose of any paragraph or paragraphs in uncomplicated passages.
- Infer the main idea or purpose of straightforward paragraphs in more challenging passages.
- Summarize basic events and ideas in more challenging passages.
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in more challenging passages.
- Infer the main idea or purpose of more challenging passages or their paragraphs.
- Summarize events and ideas in virtually any passage.
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in virtually any passage.
- Identify clear main ideas or purposes of complex passages or their paragraphs.

### **R2 Supporting Details**

- Locate basic facts (e.g., names, dates, events) clearly stated in a passage.
- Locate simple details at the sentence and paragraph level in uncomplicated passages.
- Recognize a clear function of a part of an uncomplicated passage.

- Locate important details in uncomplicated passages.
- Make simple inferences about how details are used in passages.
- Locate important details in more challenging passages.
- Locate and interpret minor or subtly stated details in uncomplicated passages.
- Discern which details, though they may appear in different sections throughout a passage, support important points in more challenging passages.
- Locate and interpret minor or subtly stated details in more challenging passages.
- Use details from different sections of some complex informational passages to support a specific point or argument.
- Locate and interpret details in complex passages.
- Understand the function of a part of a passage when the function is subtle or complex.

### **R3 Sequential, Comparative, and Cause–Effect Relationships**

- Determine when (e.g., first, last, before, after) or if an event occurred in uncomplicated passages.
- Recognize clear cause–effect relationships described within a single sentence in a passage.
- Identify relationships between main characters in uncomplicated literary narratives.
- Recognize clear cause–effect relationships within a single paragraph in uncomplicated literary narratives.
- Order simple sequences of events in uncomplicated literary narratives.
- Identify clear relationships between people, ideas, and so on in uncomplicated passages.
- Identify clear cause–effect relationships in uncomplicated passages.
- Order sequences of events in uncomplicated passages.
- Understand relationships between people, ideas, and so on in uncomplicated passages.
- Identify clear relationships between characters, ideas, and so on in more challenging literary narratives.
- Understand implied or subtly stated cause–effect relationships in uncomplicated passages.
- Identify clear cause–effect relationships in more challenging passages.
- Order sequences of events in more challenging passages.
- Understand the dynamics between people, ideas, and so on in more challenging passages.
- Understand implied or subtly stated cause–effect relationships in more challenging passages.
- Order sequences of events in complex passages.
- Understand the subtleties in relationships between people, ideas, and so on in virtually any passage.
- Understand implied, subtle, or complex cause–effect relationships in virtually any passage.

### **R5 Meaning of Words**

- Understand the implication of a familiar word or phrase and of simple descriptive language.
- Use context to understand basic figurative language.
- Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages.
- Use context to determine the appropriate meaning of virtually any word, phrase, or statement in uncomplicated passages.
- Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in more challenging passages.
- Determine the appropriate meaning of words, phrases, or statements from figurative or somewhat technical contexts.
- Determine, even when the language is richly figurative and the vocabulary is difficult, the appropriate meaning of context-dependent words, phrases, or statements in virtually any passage.

### **R6 Generalizations and Conclusions**

- Draw simple generalizations and conclusions about the main characters in uncomplicated literary narratives.
- Draw simple generalizations and conclusions about people, ideas, and so on in uncomplicated passages.
- Draw generalizations and conclusions about people, ideas, and so on in uncomplicated passages.



- Draw simple generalizations and conclusions using details that support the main points of more challenging passages.
- Draw subtle generalizations and conclusions about characters, ideas, and so on in uncomplicated literary narratives.
- Draw generalizations and conclusions about people, ideas, and so on in more challenging passages.
- Use information from one or more sections of a more challenging passage to draw generalizations and conclusions about people, ideas, and so on.
- Draw complex or subtle generalizations and conclusions about people, ideas, and so on, often by synthesizing information from different portions of the passage.
- Understand and generalize about portions of a complex literary narrative.

## Science

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### S1 Interpretation of Data

- Select a single piece of data (numerical or non-numerical) from a simple data presentation (e.g., a table or graph with two or three variables; a food web diagram).
- Identify basic features of a table, graph, or diagram (e.g., headings, units of measurement, axis labels).
- Select two or more pieces of data from a simple data presentation.
- Understand basic scientific terminology.
- Find basic information in a brief body of text.
- Determine how the value of one variable changes as the value of another variable changes in a simple data presentation.
- Select data from a complex data presentation (e.g., a table or graph with more than three variables; a phase diagram).
- Compare or combine data from a simple data presentation (e.g., order or sum data from a table).
- Translate information into a table, graph, or diagram.
- Compare or combine data from two or more simple data presentations (e.g., categorize data from a table using a scale from another table).
- Compare or combine data from a complex data presentation.
- Interpolate between data points in a table or graph.
- Determine how the value of one variable changes as the value of another variable changes in a complex data presentation.
- Identify and/or use a simple (e.g., linear) mathematical relationship between data.
- Analyze given information when presented with new, simple information.
- Compare or combine data from a simple data presentation with data from a complex data presentation.
- Identify and/or use a complex (e.g., nonlinear) mathematical relationship between data.
- Extrapolate from data points in a table or graph.
- Compare or combine data from two or more complex data presentations.
- Analyze given information when presented with new, complex information.

### S2 Scientific Investigation

- Understand the methods and tools used in a simple experiment.
- Understand the methods and tools used in a moderately complex experiment.
- Understand a simple experimental design.
- Identify a control in an experiment.
- Identify similarities and differences between experiments.
- Understand the methods and tools used in a complex experiment.
- Understand a complex experimental design.
- Predict the results of an additional trial or measurement in an experiment.
- Determine the experimental conditions that would produce specified results.
- Determine the hypothesis for an experiment.

- Identify an alternate method for testing a hypothesis.
- Understand precision and accuracy issues.
- Predict how modifying the design or methods of an experiment will affect results.
- Identify an additional trial or experiment that could be performed to enhance or evaluate experimental results.

### **S3 Evaluation of Models, Inferences, and Experimental Results**

- Select a simple hypothesis, prediction, or conclusion that is supported by a data presentation or a model.
- Identify key issues or assumptions in a model.
- Select a simple hypothesis, prediction, or conclusion that is supported by two or more data presentations or models.
- Determine whether given information supports or contradicts a simple hypothesis or conclusion and why.
- Identify strengths and weaknesses in one or more models.
- Identify similarities and differences between models.
- Determine which model(s) is (are) supported or weakened by new information.
- Select a data presentation or a model that supports or contradicts a hypothesis, prediction, or conclusion.
- Select a complex hypothesis, prediction, or conclusion that is supported by a data presentation or model.
- Determine whether new information supports or weakens a model and why.
- Use new information to make a prediction based on a model.
- Select a complex hypothesis, prediction, or conclusion that is supported by two or more data presentations or models.
- Determine whether given information supports or contradicts a complex hypothesis or conclusion and why.

## **Writing**

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### **W1 Expressing Judgments**

- Show a little understanding of the persuasive purpose of the task, but neglect to take or to maintain a position on the issue in the prompt.
- Show limited recognition of the complexity of the issue in the prompt.
- Show a basic understanding of the persuasive purpose of the task by taking a position on the issue in the prompt but may not maintain that position.
- Show a little recognition of the complexity of the issue in the prompt by acknowledging, but only briefly describing, a counterargument to the writer's position.
- Show understanding of the persuasive purpose of the task by taking a position on the issue in the prompt.
- Show some recognition of the complexity of the issue in the prompt by doing the following:
  - Acknowledging counterarguments to the writer's position
  - Providing some response to counter-arguments to the writer's position
- Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a broad context for discussion.
- Show recognition of the complexity of the issue in the prompt by doing the following:
  - Partially evaluating implications and/or complications of the issue
  - Posing and partially responding to counter-arguments to the writer's position
- Show clear understanding of the persuasive purpose of the task by taking a position on the specific issue in the prompt and offering a critical context for discussion.
- Show understanding of the complexity of the issue in the prompt by doing the following:
  - Examining different perspectives
  - Evaluating implications or complications of the issue
  - Posing and fully discussing counter-arguments to the writer's position

### **W2 Focusing on the Topic**

- Maintain a focus on the general topic in the prompt through most of the essay.

- Maintain a focus on the general topic in the prompt throughout the essay.
- Maintain a focus on the general topic in the prompt throughout the essay, and attempt a focus on the specific issue in the prompt.
- Present a thesis that establishes focus on the topic.
- Maintain a focus on discussion of the specific topic and issue in the prompt throughout the essay.
- Present a thesis that establishes a focus on the writer's position on the issue.
- Maintain a clear focus on discussion of the specific topic and issue in the prompt throughout the essay.
- Present a critical thesis that clearly establishes the focus on the writer's position on the issue.

### **W3 Developing a Position**

- Offer a little development, with one or two ideas; if examples are given, they are general and may not be clearly relevant; resort often to merely repeating ideas.
- Show little or no movement between general and specific ideas and examples.
- Offer limited development of ideas using a few general examples; resort sometimes to merely repeating ideas.
- Show little movement between general and specific ideas and examples.
- Develop ideas by using some specific reasons, details, and examples.
- Show some movement between general and specific ideas and examples.
- Develop most ideas fully, using some specific and relevant reasons, details, and examples.
- Show clear movement between general and specific ideas and examples.
- Develop several ideas fully, using specific and relevant reasons, details, and examples.
- Show effective movement between general and specific ideas and examples.

### **W4 Organizing Ideas**

- Provide a discernible organization with some logical grouping of ideas in parts of the essay.
- Use a few simple and obvious transitions.
- Present a discernible, though minimally developed, introduction and conclusion.
- Provide a simple organization with logical grouping of ideas in parts of the essay.
- Use some simple and obvious transitional words, though they may at times be inappropriate or misleading.
- Present a discernible, though underdeveloped, introduction and conclusion.
- Provide an adequate but simple organization with logical grouping of ideas in parts of the essay but with little evidence of logical progression of ideas.
- Use some simple and obvious, but appropriate, transitional words and phrases.
- Present a discernible introduction and conclusion with a little development.
- Provide unity and coherence throughout the essay, sometimes with a logical progression of ideas.
- Use relevant, though at times simple and obvious, transitional words and phrases to convey logical relationships between ideas.
- Present a somewhat developed introduction and conclusion.
- Provide unity and coherence throughout the essay, often with a logical progression of ideas.
- Use relevant transitional words, phrases, and sentences to convey logical relationships between ideas.
- Present a well-developed introduction and conclusion.

### **W5 Using Language**

- Show limited control of language by doing the following:
  - Correctly employing some of the conventions of standard English grammar, usage, and mechanics but with distracting errors that sometimes significantly impede understanding
  - Using simple vocabulary
  - Using simple sentence structure
  - Correctly employing some of the conventions of standard English grammar, usage, and mechanics but with distracting errors that sometimes impede understanding

- Using simple but appropriate vocabulary
- Using a little sentence variety, though most sentences are simple in structure
- Correctly employing many of the conventions of standard English grammar, usage, and mechanics but with some distracting errors that may occasionally impede understanding
- Using appropriate vocabulary
- Using some varied kinds of sentence structures to vary pace
- Correctly employing most conventions of standard English grammar, usage, and mechanics, with a few distracting errors but none that impede understanding
- Using some precise and varied vocabulary
- Using several kinds of sentence structures to vary pace and to support meaning
- Correctly employing most conventions of standard English grammar, usage, and mechanics, with just a few, if any, errors
- Using precise and varied vocabulary
- Using a variety of kinds of sentence structures to vary pace and to support meaning

## Appendix D: National Educational Technology Standards for Students

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**T1** Creativity and Innovation

**T2** Communication and Collaboration

**T3** Research and Information Fluency

**T4** Critical Thinking, Problem Solving, and Decision Making

**T5** Digital Citizenship

**T6** Technology Operations and Concepts

**T1** Creativity and Innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students do the following:

- a. Apply existing knowledge to generate new ideas, products, or processes.
- b. Create original works as a means of personal or group expression.
- c. Use models and simulations to explore complex systems and issues.
- d. Identify trends and forecast possibilities.

**T2** Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students do the following:

- a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
- b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
- c. Develop cultural understanding and global awareness by engaging with learners of other cultures.
- d. Contribute to project teams to produce original works or solve problems.

**T3** Research and Information Fluency

Students apply digital tools to gather, evaluate, and use information. Students do the following:

- a. Plan strategies to guide inquiry.
- b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
- c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
- d. Process data and report results.

**T4** Critical Thinking, Problem Solving, and Decision Making

Students use critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students do the following:

- a. Identify and define authentic problems and significant questions for investigation.
- b. Plan and manage activities to develop a solution or complete a project.
- c. Collect and analyze data to identify solutions and/or make informed decisions.
- d. Use multiple processes and diverse perspectives to explore alternative solutions.

**T5** Digital Citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students do the following:

- a. Advocate and practice safe, legal, and responsible use of information and technology.

- b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
- c. Demonstrate personal responsibility for lifelong learning.
- d. Exhibit leadership for digital citizenship.

**T6** Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students do the following:

- a. Understand and use technology systems.
- b. Select and use applications effectively and productively.
- c. Troubleshoot systems and applications.
- d. Transfer current knowledge to learning of new technologies.