Game (Advanced Diploma) Program Standard

The approved program standard for Game program of instruction leading to an Ontario College Advanced Diploma delivered by Ontario Colleges of Applied Arts and Technology (MTCU funding code 61900)

Ministry of Advanced Education and Skills Development
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Inquiries regarding specific Game programs offered by colleges of applied arts and technology in Ontario should be directed to the relevant college.

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- the Heads of Media, Arts and Design (HOMAD) group.

Table of Contents

I. Introduction

This document is the Program Standard for the Game program of instruction leading to an Ontario College Advanced Diploma delivered by Ontario colleges of applied arts and technology (MTCU funding code 61900).

Development of System-Wide Program Standards

In 1993, the Government of Ontario initiated program standards development with the objectives of bringing a greater degree of consistency to college programming offered across the province, broadening the focus of college programs to ensure graduates have the skills to be flexible and to continue to learn and adapt, and providing public accountability for the quality and relevance of college programs.

The Program Standards and Evaluation Unit of the Ministry of Advanced Education and Skills Development have responsibility for the development, review and approval of system-wide standards for programs of instruction at Ontario colleges of applied arts and technology.

Program Standards

Program standards apply to all similar programs of instruction offered by colleges across the province. Each program standard for a postsecondary program includes the following elements:

- **Vocational standard** (the vocationally specific learning outcomes which apply to the program of instruction in question);
- **Essential employability skills** (the essential employability skills learning outcomes which apply to all programs of instruction); and
- **General education requirement** (the requirement for general education in postsecondary programs of instruction).

Collectively, these elements outline the essential skills and knowledge that a student must reliably demonstrate in order to graduate from the program.

Individual colleges of applied arts and technology offering the program of instruction determine the specific program structure, delivery methods and other curriculum matters to be used in assisting students to achieve the outcomes articulated in the standard. Individual colleges also determine whether additional local learning outcomes will be required to reflect specific local needs and/or interests.

The Expression of Program Standards as Vocational Learning Outcomes

Vocational learning outcomes represent culminating demonstrations of learning and achievement. They are not simply a listing of discrete skills, nor broad statements of knowledge and comprehension. In addition, vocational learning outcomes are interrelated and cannot be viewed in isolation of one another. As such, they should be viewed as a comprehensive whole. They describe performances that demonstrate that significant integrated learning by graduates of the program has been achieved and verified.

Expressing standards as vocational learning outcomes ensures consistency in the outcomes for program graduates, while leaving to the discretion of individual colleges, curriculum matters such as the specific program structure and delivery methods.

The Presentation of the Vocational Learning Outcomes

The **vocational learning outcome** statements set out the culminating demonstration of learning and achievement that the student must reliably demonstrate before graduation.

The **elements of the performance** for each outcome define and clarify the level and quality of performance necessary to meet the requirements of the vocational learning outcome. However, it is the performance of the vocational learning outcome itself on which students are evaluated. The elements of performance are indicators of the means by which the student may proceed to satisfactory performance of the vocational learning outcome. The elements of performance do not stand alone but rather in reference to the vocational learning outcome of which they form a part.

The Development of a Program Standard

In establishing the standards development initiative, the Government determined that all postsecondary programs of instruction should include vocational skills coupled with a broader set of essential skills. This combination is considered critical to ensuring that college graduates have the skills required to be successful both upon graduation from the college program and throughout their working and personal lives.

A program standard is developed through a broad consultation process involving a range of stakeholders with a direct interest in the program area, including employers, professional associations, universities, secondary schools and program graduates working in the field, in addition to students, faculty and administrators at the colleges themselves. It represents a consensus of

participating stakeholders on the essential learning that all program graduates should have achieved.

Updating the Program Standard

The Ministry of Advanced Education and Skills Development will undertake regular reviews of the vocational learning outcomes for this program to ensure that the GameProgram Standard remains appropriate and relevant to the needs of students and employers across the Province of Ontario. To confirm that this document is the most up-to-date release, please contact the Ministry of Advanced Education and Skills Development at the address or email address noted on the inside cover page.

II. Vocational Standard

The Game (Advanced Diploma) program standard consists of a common core of 6 vocational learning outcomes (VLOs) and additional VLOs which are specific for each of the four streams: Game-Art (+4 VLOs), Game-Design (+5 VLOs), Game-Programming (+6 VLOs) and Game-Development (+9 VLOs). The Game-Development stream is a “generalist” stream which builds on the other three streams.

All graduates of Game programs at the advanced diploma level have achieved the six common core VLOs and additional VLOs for the specific stream from which they have graduated. They have also achieved the essential employability outcomes and met the general education (GE) requirement.

Preamble

There are four streams for Game programs at the advanced diploma level; they all share a common core of learning outcomes and branch off with additional specific learning outcomes from their respective fields.

Graduates of Game (Advanced Diploma) programs carry out a variety of functions at an entry level within a fast-changing industry.

They draw on their knowledge of the theory of games, the history of game development, and the conventions used in different game genres, when making creative decisions.

Game (Advanced Diploma) graduates have the knowledge, skills and attitudes required to support other colleagues in the game production pipeline, including game designers, artists, programmers and developers, and to function as part of a high-performing workplace team.

They develop personal and professional strategies and plans to remain current in the field and responsive to emergent technologies and national and international standards.

Graduates of Game (Advanced Diploma) programs work in employment settings that may range from small (“indie”) studios to large (“Triple A”) studios with hundreds of employees. The size and capacity of the company frequently determines the level of specialized skills required. Employees will be expected to continue to develop their skills on the job.

There may be opportunities for graduates to pursue further educational qualifications through pursuing supplemental credentials in other game-related programs, transfer pathways1 between the colleges and universities, or

occupational certifications through professional organizations. Graduates should contact individual colleges and professional associations, such as the International Game Development Association (IGDA), for more information.

Endnote: The Ontario Council on Articulation and Transfer (ONCAT) maintains the provincial postsecondary credit transfer portal, ONTransfer and the Ontario Postsecondary Transfer Guide (OPTG).

Synopsis of the Vocational Learning Outcomes – Common Core Game (Ontario College Advanced Diploma)

The graduate has reliably demonstrated the ability to:

1. analyze the differences in game genres in order to develop games that meet the needs of specific markets
2. analyze the history of video games to compare various approaches to game development
3. support the development of games by identifying and relating concepts from a range of industry roles—programming, design, and art
4. contribute as an individual and a member of a game development team to the effective completion of a game development project
5. develop strategies for ongoing personal and professional development to enhance work performance in the games industry
6. perform all work in compliance with relevant statutes, regulations, legislation, industry standards and codes of ethics

Note: The learning outcomes have been numbered as a point of reference; numbering does not imply prioritization, sequencing, nor weighting of significance.

The Vocational Learning Outcomes – Common Core

1. The graduate has reliably demonstrated the ability to

   analyze the differences in game genres in order to develop games that meet the needs of specific markets.

Elements of the Performance

- describe game genres and platforms
- identify game genres in specific game industry markets
- discuss the history of game genres identifying genres that currently exist and explaining why some have evolved over time or disappeared
- contextualize existing and proposed games within established game traditions and/or genres
- discuss how games align—or fail to align—with accepted genre definitions
- discuss the role that game genres play in influencing play mechanics and game development
- adapt games for the marketplace based on knowledge of game genres and the specific needs of the market
- analyze trends within game genres in order to forecast potential developments in the game industry

2. The graduate has reliably demonstrated the ability to

   analyze the history of video games to compare various approaches to game development.

Elements of the Performance

- define key concepts from the history of games and interactive media
- describe the history of computers, digital games and toys
- identify and analyze social factors, practices and discourses that surround games and interactive media
- discuss the evolution of gaming from early arcade and console platforms to current day to identify issues connected to game/interactive media platforms and genres
- develop a critical vocabulary to discuss the canon of significant and influential games
- situate emerging game trends within a historical context and develop strategies to support future development of games based on this knowledge

3. The graduate has reliably demonstrated the ability to

support the development of games by identifying and relating concepts from a range of industry roles—programming, design, and art.

Elements of the Performance

- identify the various roles and how they function within the game production pipeline
- define the parameters of the various roles and discuss how these parameters may change depending on the size and scope of the project and/or company
- develop strategies to support the interdisciplinary approach that exists in game development

4. The graduate has reliably demonstrated the ability to

contribute as an individual and a member of a game development team to the effective completion of a game development project.

Elements of the Performance

- contribute to the achievement of project goals and objectives while honouring the constraints of the project and the roles and responsibilities of other team members
- use interpersonal skills adapted to the requirements of the project and the team to achieve desired outcomes
- contribute to a team project or group decision-making process by applying group dynamics, conflict resolution, and negotiation techniques
- outline the steps that assess the success of a project
- analyze failures and/or areas of weakness within a project and develop strategies to address the causes of these issues in current and future projects
- analyze successes within a project and develop strategies to unpack and migrate achievements to future work
- work within a team to support the iterative process of game development

5. The graduate has reliably demonstrated the ability to

develop strategies for ongoing personal and professional development to enhance work performance in the games industry.

Elements of the Performance

- use constructive feedback to enhance work performance
- develop a strategy to keep pace with, and adapt to changing workforce demands and trends, as well as technological advances in the games industry
- identify training courses, workshops and programs to enhance employment opportunities in the games industry
- engage in activities that include critical thinking and self-evaluation to promote professionalism
- develop a plan for building a professional network and for participating in professional associations and activities
- apply skills related to entrepreneurship, working effectively in groups or teams to achieve desired goals, and resolve differing and/or opposing ideas and points of view

6. The graduate has reliably demonstrated the ability to

perform all work in compliance with relevant statutes, regulations, legislation, industry standards and codes of ethics.

Elements of the Performance

- identify relevant statutes, regulations, legislation, industry standards and codes of ethics that relate to the game industry
- analyze issues relating to the concepts of privacy, intellectual property and copyright that occur within the game industry
- analyze ethical conflicts and provide rationale for decision-making within conflicts that may arise in game development
- analyze the issues of data protection, privacy, and confidentiality and their implications for a game development project
- comply with all relevant statutes, regulations, legislation, industry standards and codes of ethics

Game-Design Stream

All graduates of the Game-Design stream programs at the Advanced Diploma level have achieved the six common core and the five additional VLOs listed in the following pages, in addition to achieving the essential employability outcomes and meeting the general education (GE) requirement.

Preamble – Game-Design

Game-Design (Advanced Diploma) graduates are able to meet the demands of industry through their ability to be fully engaged in the creation and iteration of unique gaming environments, levels, characters, assets and props, and systems, and by continually learning and honing skills as the market evolves.

Graduates apply a variety of advanced game design concepts to design and develop games. They contribute to the overall game development process by developing comprehensive game design documents, developing and executing iterative design procedures; and engaging in original world-building and level design.

Synopsis of the Vocational Learning Outcomes: Game-Design

Game-Design (Ontario College Advanced Diploma) Stream

In addition to the six common core vocational learning outcomes listed on page 6, the graduate has reliably demonstrated the ability to:

7. use game concepts to support the ongoing iteration, creation, design and development of games
8. apply game design elements to support the creation and ongoing iteration of unique gaming environments, levels, characters, assets and props
9. develop evolving and iterative game design documents that align with standard industry expectations and/or company practices
10. conceive, prototype, develop, test and evaluate procedures for the ongoing iteration, creation, design and development of games
11. engage in original world building and level design within a range of game engines

The Vocational Learning Outcomes: Game-Design

7. The graduate has reliably demonstrated the ability to

   use game concepts to support the ongoing iteration, creation, design and development of games.

Elements of the Performance

- identify basic elements of a game concept: game objects, game setting, rules, dynamics, play mechanics, goals, and conflict
- develop game “rules,” e.g., structure of play, a balance between obstacles/aids and penalties/rewards
- identify core mechanics and determine how they shape gameplay
- analyze the role of balance in game design, e.g., situational balancing techniques and equivalency balancing
- develop and implement strategies for generating new ideas and for turning new ideas into viable game concepts
- develop and implement abstract design elements including positive and negative feedback systems, emergent complexity, simulation/emulation, and communication systems
- identify psychological design considerations and make decisions for game design based on how those considerations support or detract from successful game design, e.g., operant conditioning, flow states, game addiction, rewards and penalties, difficulty curve, and fostering a variety of gameplay styles
- use principles of interface design theory to support successful game design, e.g., computer UI theory, human-computer interaction, information visualization, user task modeling, balancing player control schemes, and the impact of specific hardware constraints
- engage all aspects of the iterative nature of game design: create, test, change, and repeat

8. The graduate has reliably demonstrated the ability to

apply game design elements to support the creation and ongoing iteration of unique gaming environments, levels, characters, assets and props.

Elements of the Performance

- create interactive and highly responsive worlds that rely on effective spatial design
- design active and interactive tasks within the gaming environment (e.g., world/geometry interaction, character interaction, and puzzles)
- implement design integration in ways that meld space and task, integrate art and gameplay, and respect the design implications of the selected game platform
- develop control schemes (e.g., direct/indirect manipulation, movement and navigation, tools and tool manipulation, inventories, and natural controller mappings)
- develop original environments, levels, characters, assets and props while aligning with the specifications outlined in the game design documents
- engage in multiple forms of game prototyping (e.g., paper prototyping, computer-based prototyping, physical prototyping, and digital prototypes of individual systems or mechanics)

9. The graduate has reliably demonstrated the ability to

develop evolving and iterative game design documents that align with standard industry expectations and/or company practices.

Elements of the Performance

- analyze the role of documentation in the production pipeline
- develop and maintain a game design document
- write concepts, proposals, rules documents, and design documentation
- communicate design ideas clearly to the team at the appropriate level of detail.

10. The graduate has reliably demonstrated the ability to

    conceive, prototype, develop, test and evaluate procedures for the ongoing iteration, creation, design and development of games.

Elements of the Performance

- use paper and multimedia techniques to prototype game design ideas
- compare testing methods for games and evaluate results using analytical tools (e.g., spreadsheets and databases)
- adapt concepts used in experience design to structure and test interactive media prototypes
- contribute to the design, testing, and documentation of game designs that incorporate human factors
- apply current development techniques in design testing and prototyping

11. The graduate has reliably demonstrated the ability to

engage in original world building and level design within a range of game engines.

Elements of the Performance

- apply and analyze techniques specific to world building including
  a. importing static assets
  b. importing animated assets
  c. creating and applying material trees (shaders)
  d. applying animation
  e. terrain generation
  f. lighting
  g. cameras
  h. F/X (Particle, camera)
  i. triggers, logic and sequences
- apply and analyze techniques specific to level design including
  a. creating flow, features and pacing
  b. triggering game events
  c. levelling and balance
  d. modular design

Game-Art Stream

All graduates of the Game-Art stream programs at the Advanced Diploma level have achieved the six common core and the four additional VLOs listed in the following pages, in addition to achieving the essential employability outcomes and meeting the general education (GE) requirement.

Preamble: Game-Art

Game-Art (Advanced Diploma) graduates are able to meet the demands of industry through their ability to generate user interface design to develop and create art that optimizes the aesthetics and functioning of games in alignment with Game Design Documents, and by continually learning and honing skills as the market evolves.

Graduates contribute to the overall game development process by developing pre-production and conceptual art; creating original game assets; engaging in original world-building and level design within a range of game engines; and generating user interface design aligned with game design documents

Synopsis of the Vocational Learning Outcomes: Game-Art

Game-Art (Ontario College Advanced Diploma) Stream

In addition to the six common core vocational learning outcomes listed on page 6, the graduate has reliably demonstrated the ability to:

7. develop pre-production and conceptual art for games and gaming through the selection and application of relevant design tools and drawing techniques
8. create original game assets to meet requirements outlined in game design documents and/or creative briefs
9. engage in original world building and level design within a range of game engines to meet industry and marketplace requirements
10. generate user interface design in alignment with Game Design Documents to optimize both the aesthetics and function of gameplay

The Vocational Learning Outcomes: Game-Art

7. The graduate has reliably demonstrated the ability to

   develop pre-production and conceptual art for games and gaming through the selection and application of relevant design tools and drawing techniques.

Elements of the Performance

- brainstorm and develop early basic concepts for art elements
- use reference images and digital tools to produce multiple iterations of conceptual designs
- create model sheets that can be translated into 3D game assets
- apply a range of drawing techniques (digital and analogue) to create characters, environments, tools, props, etc.
- apply theory of anatomy and physiology as it pertains to character development
- apply theory of visual design to support the creation of game assets and props (composition, lighting and colour, and graphic design/typography)

8. The graduate has reliably demonstrated the ability to

   create original game assets to meet requirements outlined in game design documents and/or creative briefs.

Elements of the Performance

- model and/or draw assets in both 3D and 2D
- effectively optimize assets to ensure efficient playback in real-time
- effectively export an optimized game asset to a game engine
- apply and analyze techniques specific to the creation of 3D assets (e.g., modeling, High Poly sculpting or hard surface modeling--as it pertains to AAA workflow—retopologizing, unwrapping, texturing including hand painted, reference or baked (as required), and import to engine/shader setup
- apply and analyze techniques specific to the creation of 2D assets (e.g., asset creation, texturing, export to engine—puppet rig, sprite sheet, and static—and camera facing setup in engine.)
- design animatable characters using the principles of character design and creativity

9. The graduate has reliably demonstrated the ability to

engage in original world building and level design within a range of game engines to meet industry and marketplace requirements.

Elements of the Performance

- apply and analyze techniques specific to world building including
  a. importing static assets
  b. importing animated assets
  c. creating and applying material trees (shaders)
  d. applying animation
  e. terrain generation
  f. lighting
  g. cameras
  h. F/X (Particle, camera)
  i. triggers, logic and sequences
- apply and analyze techniques specific to level design including
  a. creating flow, features and pacing
  b. triggering game events
  c. levelling and balance
  d. modular design

10. The graduate has reliably demonstrated the ability to

    generate user interface design in alignment with Game Design Documents to optimize both the aesthetics and function of gameplay.

Elements of the Performance

- identify key concepts, vocabulary and frames of reference to participate in meaningful discussion about user interface design
- develop sketches of 2D interfaces from assigned/documented requirements
- design, test, and document visual designs for interfaces and controls that apply appropriate theories of interface design
- collaborate with a project team to create a functioning user interface in a creative group project based on documented requirements
- combine feedback from testing, observations and critique to solve problems with user interface

Game-Programming Stream

All graduates of the Game-Programming stream programs at the Advanced Diploma level have achieved the six common core and the six additional VLOs listed in the following pages, in addition to achieving the essential employability outcomes and meeting the general education (GE) requirement.

Preamble: Game-Programming

Game-Programming (Advanced Diploma) graduates are able to meet the demands of industry through their ability to use a variety of game engines and applications and programming code to support real-time game environments and simulations, and by continually learning and honing skills as the market evolves.

Graduates contribute to the overall game development process by analyzing and recommending appropriate game engines for specific game designs; applying advanced mathematical and scientific theory to 2D and 3D game applications; using systems architectures, graphics programming and sound/audio effectively; optimizing programming code for performance and other criteria; developing artificial intelligence strategies and tactics; and implementing network solutions and coordinating user groups for seamless live interactions.

Synopsis of the Vocational Learning Outcomes: Game-Programming

Game-Programming (Ontario College Advanced Diploma) Stream

In addition to the six common core vocational learning outcomes listed on page 6, the graduate has reliably demonstrated the ability to:

7. analyze game engines and make recommendations for the most appropriate game engine to support new and existing projects
8. apply advanced theories and principles of mathematics and science as required for 2D and 3D games
9. support real-time game environments and simulations using elements such as system architecture, graphics programming, and sound/audio to optimize performance
10. optimize programming code to achieve high performance, high speed and reduced memory utilization, for all types of games
11. develop artificial intelligence strategies and tactics to support real-time game environments and simulations
12. implement network solutions and co-ordinate user groups to ensure seamless network interaction among different groups in on-line game communities

The Vocational Learning Outcomes: Game-Programming

7. The graduate has reliably demonstrated the ability to

   analyze game engines and make recommendations for the most appropriate game engine to support new and existing projects.

Elements of the Performance

- describe the purpose and importance of game engines
- identify game engines used in existing games and analyze effectiveness
- compare the features and capabilities of various game engines
- use methodologies and practices to create single platform applications while paying attention to the limitations of implementing cross-platform technology
- create an executable program that produces or transforms data into a format that a game engine can utilize
- identify and analyze appropriate game engines to experiment with basic production requirements

8. The graduate has reliably demonstrated the ability to

   apply advanced theories and principles of mathematics and science as required for 2D and 3D games.

Elements of the Performance

- use basic logic, linear algebra, physics and calculus as it applies to the movement of objects and entities in games/interactive systems
- analyze concepts such as rotations, translations, integration in existing games
- apply techniques from linear algebra, calculus and physics to explore interactive gameplay by expressing the movement of objects as mathematical formulae
- analyze uses of position, velocity, acceleration, angular momentum in existing games
- adopt physics and mathematical techniques to explore the development of a physics engine

9. The graduate has reliably demonstrated the ability to

support real-time game environments and simulations using elements such as system architecture, graphics programming, and sound/audio to optimize performance.

Elements of the Performance

- integrate subsystems support real-time game environments and simulations
- incorporate and extend third party systems in a game engine
- apply principles of resource budgeting (CPU, GPU, memory) to support real-time game environments and simulations
- apply advanced rendering techniques for realistic simulations and game environments
- apply advanced animation techniques to enrich the look and feel of the game experience
- integrate sound and audio programming (3D positional sound, audio channels, and audio prioritization)
- use professional recording and editing principles and assigned/documented requirements to produce sound assets

10. The graduate has reliably demonstrated the ability to

optimize programming code to achieve high performance, high speed and reduced memory utilization, for all types of games.

Elements of the Performance

- use a compiler, or other tools, to optimize performance
- apply and analyze appropriate data structures (e.g., frame buffers, design patterns, etc.) to support database storage optimization
- apply and analyze relational and non-relational storage solutions for multiple platforms: console, PC, web, and mobile

11. The graduate has reliably demonstrated the ability to

develop artificial intelligence strategies and tactics to support real-time game environments and simulations.

Elements of the Performance

- identify the difference in goals between game AI and traditional AI
- identify uses of path finding, steering behaviours, triggers/sensors, states, transitions between states, machine learning in existing games
- apply appropriate AI techniques for a range of applications where AI is appropriate
- reproduce core AI algorithms (e.g., steering behaviours, finite state machines, learning algorithms, search algorithms)
- produce an executable program that demonstrates steering behaviours, flocking, logic based decisions, and finite state machines
- adopt common artificial intelligence techniques to support control of behaviours, path finding in gameplay and/or interactive systems

12. The graduate has reliably demonstrated the ability to

implement network solutions and co-ordinate user groups to ensure seamless network interaction among different groups in on-line game communities.

Elements of the Performance

- define key concepts about networks as applied to games and interactive media (e.g. types of networked games (MMO, Single player online, p2p), LAN/WAN, components (routers, switches), protocols (UDP, TCP/IP)
- analyze how networks are used in existing games (e.g., p2p, tcp/ip, client/server)
- apply client/server design techniques to support networked gameplay
- produce an executable program that demonstrates client/server network communication.

Game-Development Stream

All graduates of the Game-Development stream programs at the Advanced Diploma level have achieved the six common core and the nine additional VLOs listed in the following pages, in addition to achieving the essential employability outcomes and meeting the general education (GE) requirement.

Preamble: Game-Development

Game Development (Advanced Diploma) graduates are able to meet the demands of industry through their ability to be fully engaged in the development of games and by continually learning and honing skills as the market evolves.

Graduates conceive, prototype, develop, test and evaluate procedures for the creation, design, programming, production, testing and debugging of games. They apply a variety of game design, art and programming concepts and tools to produce original games with unique gaming environments, levels, characters, assets and props through an ongoing iteration process.

Synopsis of the Vocational Learning Outcomes: Game-Development

Game-Development (Ontario College Advanced Diploma) Stream

In addition to the six common core vocational learning outcomes listed on page 6, the graduate has reliably demonstrated the ability to:

7. apply conceptual game design elements to support the ongoing iteration, creation, programming, design, and development of games
8. apply practical game design elements to support the ongoing iteration, creation, programming, design and developing of unique gaming environments, levels, characters, assets and props
9. apply programming principles and techniques to create operational games or game components
10. apply artificial intelligence and/or network implementation strategies to support real-time game environments and simulations
11. utilize game engine functionality at an advanced level to support real-time games and simulations
12. create original game props, characters and assets based on the concepts and requirements outlined in game design documents
13. contribute to world building and level design, including using a game engine
14. conceive, prototype, develop, test and evaluate procedures for the creation, design, programming, production and testing of games in a group environment
15. test, debug and correct game components to ensure efficient and appropriate game functionality

The Vocational Learning Outcomes: Game- Development

7. The graduate has reliably demonstrated the ability to

   apply conceptual game design elements to support the ongoing iteration, creation, programming, design, and development of games.

Elements of the Performance

- identify basic elements of a game concept: game objects, game setting, rules, dynamics, play mechanics, goals, and conflict
- develop game “rules,” e.g., structure of play, a balance between obstacles/aids and penalties/rewards
- define and develop game metrics
- discuss how game analytics can inform decisions in the iterative game design process
- identify core mechanics and describe how they shape gameplay
- analyze the role of balance in game design, e.g., situational balancing techniques and equivalency balancing
- identify key concepts, vocabulary and frames of reference to participate in analytical discussion about user interface design
- develop and implement strategies for generating new ideas and for turning new ideas into viable game concepts

8. The graduate has reliably demonstrated the ability to

apply practical game design elements to support the ongoing iteration, creation, programming, design and developing of unique gaming environments, levels, characters, assets and props.

Elements of the Performance

- engage in multiple forms of game prototyping (e.g., paper prototyping, computer-based prototyping, physical prototyping, and digital prototypes of individual systems or mechanics)
- produce relevant game design documentation relating to game concepts, worlds, levels, assets and characters
- design active and interactive tasks within the gaming environment (e.g., world/geometry interaction, character interaction, and puzzles)
- design original environments, levels, characters, assets and props while aligning with the specifications outlined in game design documents
- develop control schemes (e.g., direct/indirect manipulation, movement and navigation, tools and tool manipulation, inventories, and natural controller mappings)
- generate user interface designs in alignment with creative documentation to optimize both the aesthetics and function of gameplay
- apply integration practices to consolidate design, art, and programming/scripting aspects of a game

9. The graduate has reliably demonstrated the ability to

apply programming principles and techniques to create operational games or game components.

Elements of the Performance

- develop programming code or scripts to successfully solve game specific challenges
- implement modular solutions to maximize code reuse and portability
- apply programming, debugging and profiling techniques to maximize game performance and minimize memory utilization
- apply and analyze appropriate data structures such as arrays, stacks, queues, linked lists, trees, and hash tables to maintain and optimize game data
- employ techniques from linear algebra, calculus and physics as they relate to position, rotations, translations, velocity, acceleration and angular momentum in games/interactive systems
- apply and analyze relational and non-relational storage solutions for multiple platforms, such as console, PC, web, and mobile

10. The graduate has reliably demonstrated the ability to

apply artificial intelligence and/or network implementation strategies to support real-time game environments and simulations.

Elements of the Performance

- identify uses of artificial intelligence path finding, steering behaviours, triggers/sensors, states, transitions between states, machine learning in existing games
- produce executable programs that demonstrate artificial intelligence steering behaviours, flocking, logic based decisions, and finite state machines
- adopt common artificial intelligence techniques to support control of behaviours, path finding in gameplay and/or interactive systems
- define key concepts about networks as applied to games and interactive media (e.g., types of networked games--MMO, Single player online, Peer-to-peer, LAN/WAN, protocols--UDP, TCP/IP0)
- describe how networks are used in existing games (e.g., Peer-to-peer, tcp/ip, client/server)
- produce an executable program that demonstrates a form of network communication

11. The graduate has reliably demonstrated the ability to

    utilize game engine functionality at an advanced level to support real-time games and simulations.

Elements of the Performance

- integrate subsystems to support real-time game environments and simulations
- optimize assets and code to support real-time game environments and simulations
- apply advanced rendering techniques for realistic simulations and game environments
- apply advanced animation techniques to enrich the look and feel of the game experience
- integrate sound and audio programming (3D positional sound, audio channels, and audio prioritization)

12. The graduate has reliably demonstrated the ability to

create original game props, characters and assets based on the concepts and requirements outlined in game design documents.

Elements of the Performance

- develop pre-production and conceptual art designs for games
- apply a range of drawing techniques to create game characters, environmental elements and props
- apply theory of visual design to support the creation of game assets including perspective, composition, lighting, colour, scale and typography
- model and/or draw game characters and assets in both 2D and 3D
- apply and analyze techniques specific to the creation of 2D game assets (e.g., asset creation, texturing, sprite sheets and rigging)
- apply and analyze techniques specific to the creation of 3D assets (e.g., modeling, High Poly sculpting or modeling, retopologizing (Low Poly), texturing, unwrapping, creating/organizing UVs, rigging and animating
- effectively optimize assets to ensure efficient playback in a game engine
- create, model, rig, texture and animate characters using the principles of character design.

13. The graduate has reliably demonstrated the ability to

contribute to world building and level design, including using a game engine.

Elements of the Performance

- apply techniques specific to world building, such as:
  a. importing static assets
  b. importing animated assets
  c. creating and applying material trees (shaders)
  d. applying animation
  e. terrain generation
  f. lighting
  g. cameras
  h. F/X (Particle, camera)
  i. triggers, logic and sequences
- apply techniques specific to level design, such as:
  a. creating flow, features and pacing
  b. triggering game events
  c. levelling and balance
  d. modular design

14. The graduate has reliably demonstrated the ability to

conceive, prototype, develop, test and evaluate procedures for the creation, design, programming, production and testing of games in a group environment.

Elements of the Performance

- write and maintain game documentation (concepts, rules, characters, levels, assets) in a Game Design Document
- utilize a Game Design Document in the production pipeline to communicate ideas clearly to the team at the appropriate level of detail
- contribute to the design, programming, art, production, testing and documentation of games
- use professional recording and editing principles and assigned/documented requirements to produce sound assets
- schedule and adhere to appropriate design, art, and programming milestones during the production of games
- maintain and adapt project content, documentation and schedules to account for unforeseen development challenges
- collaborate with a project team to create a functioning user interface
- combine feedback from testing, observations and critiques to solve or improve game elements such as user interface design, game mechanics, art and sound effects
- contribute to the project management process of a game development project in a group environment

15. The graduate has reliably demonstrated the ability to

test, debug and correct game components to ensure efficient and appropriate game functionality.

Elements of the Performance

- identify and debug programming code deficiencies
- identify and correct graphic layer glitches and bugs
- test and tune game level balance, progression, mechanics, connectivity, user interface and/or playability domains appropriately to meet gaming objectives
- conduct Split (A/B) testing

III. Essential Employability Skills

All graduates of the Game (Advanced Diploma) program of instruction must have reliably demonstrated the essential employability skills learning outcomes listed on the following pages, in addition to achieving the vocational learning outcomes and meeting the general education requirement.

Context

Essential Employability Skills (EES) are skills that, regardless of a student's program or discipline, are critical for success in the workplace, in day-to-day living and for lifelong learning.

The teaching and attainment of these EES for students in, and graduates from, Ontario's colleges of applied arts and technology are anchored in a set of three fundamental assumptions:

- these skills are important for every adult to function successfully in society today
- our colleges are well equipped and well positioned to prepare graduates with these skills
- these skills are equally valuable for all graduates, regardless of the level of their credential, whether they pursue a career path, or they pursue further education

Skill Categories

To capture these skills, the following six categories define the essential areas where graduates must demonstrate skills and knowledge.

- Communication
- Numeracy
- Critical Thinking & Problem Solving
- Information Management
- Interpersonal
- Personal

Application and Implementation

In each of the six skill categories, there are a number of defining skills, or sub skills, identified to further articulate the requisite skills identified in the main skill categories. The following chart illustrates the relationship between the skill categories, the defining skills within the categories and learning outcomes to be achieved by graduates from all postsecondary programs of instruction that lead to an Ontario College credential.

EES may be embedded in General Education or vocational courses, or developed through discrete courses. However these skills are developed, all graduates with Ontario College credentials must be able to reliably demonstrate the essential skills required in each of the six categories.

Skill Category	**Defining Skills:** Skill areas to be demonstrated by graduates:	**Learning Outcomes:** The levels of achievement required by graduates. The graduate has reliably demonstrated the ability to:
Communication	• Reading • Writing • Speaking • Listening • Presenting • Visual literacy	1. communicate clearly, concisely and correctly in the written, spoken and visual form that fulfills the purpose and meets the needs of the audience. 2. respond to written, spoken or visual messages in a manner that ensures effective communication.
Numeracy	• Understanding and applying mathematical concepts and reasoning • Analyzing and using numerical data • Conceptualizing	1. execute mathematical operations accurately.
Critical Thinking & Problem Solving	• Analyzing • Synthesizing • Evaluating • Decision making • Creative and innovative thinking	1. apply a systematic approach to solve problems. 2. use a variety of thinking skills to anticipate and solve problems.

Skill Category	**Defining Skills:** Skill areas to be demonstrated by graduates:	**Learning Outcomes:** The levels of achievement required by graduates. The graduate has reliably demonstrated the ability to:
Information Management	• Gathering and managing information • Selecting and using appropriate tools and technology for a task or a project • Computer literacy • Internet skills	1. locate, select, organize and document information using appropriate technology and information systems. 2. analyze, evaluate and apply relevant information from a variety of sources.
Interpersonal	• Teamwork • Relationship management • Conflict resolution • Leadership • Networking	1. show respect for the diverse opinions, values, belief systems and contributions of others. 2. interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.
Personal	• Managing self • Managing change and being flexible and adaptable • Engaging in reflective practices • Demonstrating personal responsibility	1. manage the use of time and other resources to complete projects. 2. take responsibility for one's own actions, decisions and their consequences.

IV. General Education Requirement

All graduates of the Game (Advanced Diploma) program must have met the general education requirement described on the following pages, in addition to achieving the vocational and essential employability skills learning outcomes.

Requirement

The General Education Requirement for programs of instruction is stipulated in the Credentials Framework (Appendix A in the Minister's Binding Policy Directive Framework for Programs of Instruction).

In programs of instruction leading to either an Ontario College Diploma or an Ontario College Advanced Diploma, it is required that graduates have been engaged in learning that exposes them to at least one discipline outside their main field of study and increases their awareness of the society and culture in which they live and work. This will typically be accomplished by students taking 3 to 5 courses (or the equivalent) designed discretely and separately from vocational learning opportunities.

This general education learning would normally be delivered using a combination of required and elective processes.

Purpose

The purpose of General Education in the Ontario college system is to contribute to the development of citizens who are conscious of the diversity, complexity and richness of the human experience; who are able to establish meaning through this consciousness; and who, as a result, are able to contribute thoughtfully, creatively and positively to the society in which they live and work.

General Education strengthens students' essential employability skills, such as critical analysis, problem solving and communication, in the context of an exploration of topics with broad-based personal and/or societal importance.

Themes

The themes listed below will be used to provide direction to colleges in the development and identification of courses that are designed to fulfil the General Education Requirement for programs of instructions.

Each theme provides a statement of Rationale and offers suggestions related to more specific topic areas that could be explored within each area. These suggestions are neither prescriptive nor exhaustive. They are included to provide guidance regarding the nature and scope of content that would be judged as meeting the intent and overall goals of General Education.

1. Arts in Society:

Rationale:

The capacity of a person to recognize and evaluate artistic and creative achievements is useful in many aspects of his/her life. Since artistic expression is a fundamentally human activity, which both reflects and anticipates developments in the larger culture, its study will enhance the student's cultural and self-awareness.

Content:

Courses in this area should provide students with an understanding of the importance of visual and creative arts in human affairs, of the artist's and writer's perceptions of the world and the means by which those perceptions are translated into the language of literature and artistic expression. They will also provide an appreciation of the aesthetic values used in examining works of art and possibly, a direct experience in expressing perceptions in an artistic medium.

2. Civic Life:

Rationale:

In order for individuals to live responsibly and to reach their potential as individuals and as citizens of society, they need to understand the patterns of human relationships that underlie the orderly interactions of a society's various structural units. Informed people will have knowledge of the meaning of civic life in relation to diverse communities at the local, national and global level and an awareness of international issues and the effects of these on Canada, as well as Canada's place in the international community.

Content:

Courses in this area should provide students with an understanding of the meaning of freedoms, rights and participation in community and public life, in addition to a working knowledge of the structure and function of various levels of government (municipal, provincial, national) in a Canadian and/or in an international context. They may also provide an historical understanding of major political issues affecting relations between the various levels of government in Canada and their constituents.

3. Social and Cultural Understanding:

Rationale:

Knowledge of the patterns and precedents of the past provide the means for a person to gain an awareness of his or her place in contemporary culture and society. In addition to this awareness, students will acquire a sense of the main currents of their culture and that of other cultures over an extended period of time in order to link personal history to the broader study of culture.

Content:

Courses in this area are those that deal broadly with major social and cultural themes. These courses may also stress the nature and validity of historical evidence and the variety of historical interpretation of events. Courses will provide the students with a view and understanding of the impact of cultural, social, ethnic or linguistic characteristics.

4. Personal Understanding:

Rationale:

Educated people are equipped for life-long understanding and development of themselves as integrated physiological and psychological entities. They are aware of the ideal need to be fully functioning persons: mentally, physically, emotionally, socially, spiritually and vocationally.

Content:

Courses in this area will focus on understanding the individual: his or her evolution; situation; relationship with others; place in the environment and universe; achievements and problems; and his or her meaning and purpose. They will also allow students the opportunity to study institutionalized human social behaviour in a systematic way. Courses fulfilling this requirement may be oriented to the study of the individual within a variety of contexts.

5. Science and Technology:

Rationale:

Matter and energy are universal concepts in science, forming a basis for understanding the interactions that occur in living and non-living systems in our universe. Study in this area provides an understanding of the behaviour of matter that provides a foundation for further scientific study and the creation of broader understanding about natural phenomena.

Similarly, the various applications and developments in the area of technology have an increasing impact on all aspects of human endeavour and have numerous social, economic and philosophical implications. For example, the operation of computers to process data at high speed has invoked an interaction between machines and the human mind that is unique in human history. This and other technological developments have a powerful impact on how we deal with many of the complex questions in our society.

Content:

Courses in this area should stress scientific inquiry and deal with basic or fundamental questions of science rather than applied ones. They may be formulated from traditional basic courses in such areas of study as biology, chemistry, physics, astronomy, geology or agriculture. As well, courses related to understanding the role and functions of computers (e.g., data management and information processing) and assorted computer-related technologies should be offered in a non-applied manner to provide students with an opportunity to explore the impact of these concepts and practices on their lives.