UNREAL FUTURES
CAREERS IN FASHION

Educator's Guide

UNREAL ENGINE

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CAREERS IN FASHION

The “Unreal Futures: Careers in Fashion” project helps students learn the latest tools in interactive 3D and apply them to solve career-focused problems, giving students **a glimpse into the fashion industry with a hands-on, real-world digital fashion project**.

In this project, students will use Unreal Engine to create their own digital 3D environment. By doing so, students learn how the real-time engines that power PC and console games are used in a variety of other industries, and get a behind-the-scenes look at the digital fashion industry through interviews with professionals.

Through this process students will be invited to engage in learning about computer science, design, and physics as they apply their newfound knowledge in context to solve real-world problems.

Key Terms

Interactive 3D: a digital environment that allows for real-time, 3D interaction. Examples of interactive 3D include virtual reality, augmented reality, or various online games.

Real-time rendering: the process by which digital 3D images are converted (in real time) to 2D images, allowing for immediate feedback and live interaction.

Unreal Engine: computer software specialized to render 3D images in real time.

Sequencer: a cinematic toolset that provides director-level control over cut scenes, dynamic sequences, and movies.

For more key terms, please refer to the ***Creator’s Field Guide to Emerging Careers in Interactive 3D***, *pg. 44*

Student Technology Requirements

Recommended Hardware and Software Specifications
Instructions for Mac users

Computer (Desktop or Laptop)

Handheld Mouse (Strongly recommended)

Computer Software (Unreal Engine)

Internet Access

Description of class / learning environment

These lessons use a context-based approach to teach students about the applications of Unreal Engine within the context of how it is used in a variety of industries. Through this process students acquire real-world skills, culminating in the creation of a final rendered video project. The learning environment is designed to directly address the proverbial student question: "Why do I need to learn this?"

The final project encourages students to apply technical skills (navigating the Unreal Engine interface, basics of virtual cameras, lighting, animation, and rendering) to solve a real-world problem (creating realistic and exciting digital representations of real-world objects like clothing). Students will not only learn how to use new pieces of technology, but will also apply their understanding within context, keeping in mind the constraints, limitations, and standard practices of a particular industry (fashion).

Towards completion of their final project, students will follow a self-directed, iterative series of steps summarized in Figure 1, with the teacher serving as a facilitator and extra guide.

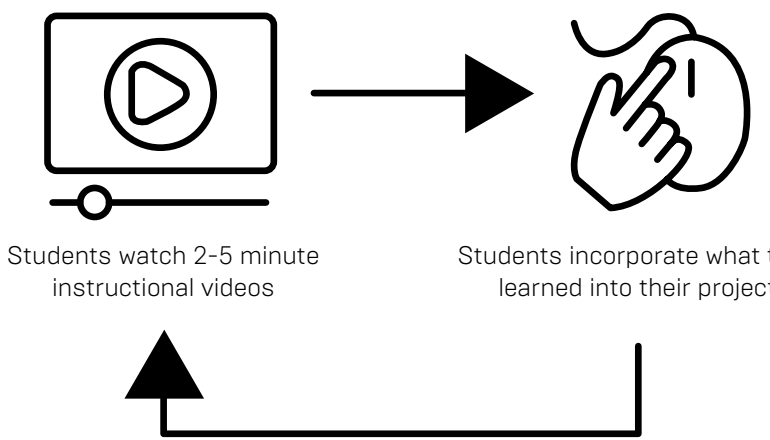

Figure 1: Overview of the learning environment and student journey. Students watch brief introductory videos and tutorials, guiding them through the creation of their final video project (digital fashion experience).

Lesson Overview

The world of fashion is a multi-billion-dollar industry. From the clothes we wear to the clothes we see in advertisements, games, and movies, fashion is all around us. The future of fashion, however, is digital. Fashion houses are shifting to designing, creating, iterating, and showcasing their collections digitally. Digital production reduces the traditional barriers to efficient, effective fashion design: time, money, and sustainability.

The design, creation, and marketing of fashion products can be a long, costly, and potentially wasteful process. Traditionally, to bring an idea for a garment to fruition, physical products need to be designed, created, shipped back and forth, iterated upon, and finally manufactured. This process, however, can lead to products or colors being made which end up having no significant interest in the marketplace.

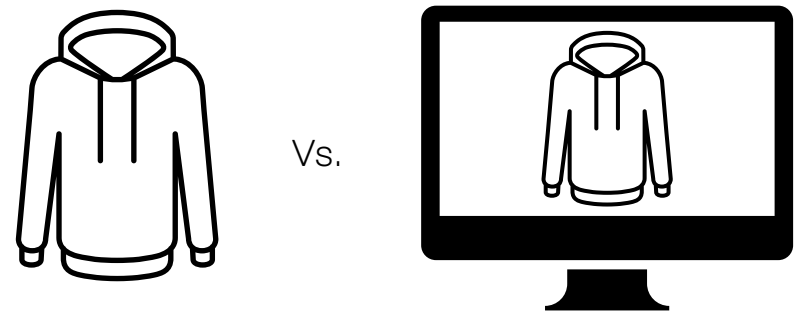

Figure 2: Students will learn about representing real world objects (like garments) in a digital, yet realistic virtual environment.

Digital production reduces these challenges and better streamlines the design and creation of fashion. However, these digital representations need to be hyper-realistic to ensure they appear and behave like a real-world garment.

The success and popularity of the digital fashion industry is based upon a suite of computer software that creates the visuals and handles the complex inputs and outputs inherent to creating realistic digital garments. The goal of this lesson is to help students understand and use the computational engines behind digital fashion.

To do this, students will be introduced to Unreal Engine, computer software that specializes in real-time rendering of 3D images. While Unreal Engine is often associated with game development (it powers popular games like *Fortnite*), the world of digital fashion is leveraging this computational engine to streamline the creation of fabrics, designs, and clothing.

Computational engines like Unreal Engine can be used to design, create, and market digital garments on demand, precluding the need to produce a physical product prior to assessing its market feasibility. Thus, by leveraging realistic 3D visualizations of the designs, brands can improve sustainability of their manufacturing process while also reducing the cost of design and production.

In this lesson, students will become proficient in navigating Unreal Engine and the animation editor, called Sequencer, to create an immersive, digital fashion experience. Through this process, students will learn that the computational engines that power the games industry (along with the engineering and mathematics required to develop the engines) are also used in a variety of other industries. They will also get a behind-the-scenes look at the digital fashion industry itself through interviews with professionals.

Essential Questions/Big Ideas

1. What is interactive 3D and how can it be applied to solve real-world problems?
2. Which careers rely on interactive 3D, and what are the skills I need to enter these fields?

Learning Outcomes/Objectives

1. Understand the basic principles of animation and interactive 3D by practicing the use of tools like Unreal Engine and Sequencer to create a 3D virtual environment.
2. Identify and describe the characteristics of the real world (lighting, materials, visual angles) that are necessary to create a realistic virtual 3D environment.
3. List and describe a variety of careers that rely on tools like Unreal Engine.
4. Revise and develop a solution to a real-world problem (creating virtual fashion) by breaking the problem down into smaller, more manageable steps that can be solved through computational thinking.
5. Analyze solutions to complex real-world problems by comparing and contrasting different solutions (real-time rendering vs. offline rendering vs. live recreation) and listing the constraints of each.

Context of Lesson: No prior knowledge is specifically required to complete this lesson.

Learning Activities

Students will be guided through a series of videos (Figure 1). The topics to be addressed within the videos include but are not limited to:

1. **General overview:** Introduces the concept of interactive 3D and examples of the type of fashion environments students will be creating using Unreal Engine and interactive 3D.
2. **Career-focused overview:** Students learn more about careers in the fashion industry, hearing about exciting jobs and receiving advice directly from industry professionals.
3. **Orientation to the Unreal Engine interface:** Tutorials on downloading and installing Unreal Engine, along with the basics of the Unreal Engine interface, how to load a 3D environment, and various controls.
4. **Introduction to building an interactive 3D environment:** Demonstrates how to add, modify, and transform elements within a 3D environment, including how to add virtual cameras, lighting, and other visual effects.
5. **Design challenges and creativity:** Students apply their technical skills to achieve additional artistic effects (modified lighting, objects, and creative animations of their own design).

Assessments

The assessments below are designed to address the learning outcomes.

1. Summative assessment of final rendered videos using the provided rubric (LO #1, 2, 4).
2. Pre- and post-surveys to assess if students learned about the characteristics of a realistic 3D environment (LO #2).
3. Pre- and post-surveys to assess if students learned about the various career applications for Unreal Engine (LO #3).
4. Pre- and post-surveys to assess if students learned about the differences, pros, and cons between Unreal Engine (real-time rendering), offline rendering, and live recreation (LO #5).

Rubric

Name: Date:

The goal of this project is to learn about Unreal Engine, Sequencer, and interactive 3D in order to become a 3D creator. Those viewing your final rendered fashion experience should be able to use the criteria below to assess what you have learned based on the quality and detail of your project.

	Developing (1)	Competent (2)	Proficient (3)	Distinguished (4)	Score
Virtual lighting	Minimal changes to the lighting of the scene. Color and lighting look nearly identical to the video example.	Noticeable adjustments to the intensity and quality of the light source were added.	Significant adjustments to the intensity and quality of the light source were added to the scene. This could include adding lights beyond three-point lighting.	Advanced adjustments to the lighting were added to the scene. This could include multiple new added lights beyond three- point lighting and significant changes to color, intensity, and location.	
Virtual cameras and animation	Minimal additions to the camera animation of the scene. Examples include only having one camera angle, limited camera movement, and no animations or movements of the objects in the scene.	More advanced changes to the camera and animation of the scene. Examples include having multiple camera angles, addition of camera movement, or a camera path (rail).	Includes having multiple camera angles, addition of camera movement, and a camera path (rail) which differs from the video example.	Includes having multiple camera angles, addition of camera movement, and complex camera paths (rails).	
Creative design	Work entirely reflects the examples shown in the tutorial videos. No creative additions were applied.	Work incorporates at least one creative addition. Examples include changes to the intensity or color of the light (to achieve mood), or altering the animation of the camera.	Work incorporates at least two creative additions. Examples include changes to the intensity or color of the light (to achieve mood), or altering the animation of the camera.	Work incorporates at least three creative additions. Examples include changes to the intensity or color of the light (to achieve mood), altering the animation of the camera, or adding multiple garments to the environment.	
Realism	Rendered scene appears to be digitally generated. Few modifications were applied to achieve realism (lighting, shadows, reflections, depth of field).	Some modifications were applied to achieve realism (lighting, shadows, reflections, depth of field), but the shot still lacks realism.	Significant modifications were applied to achieve realism (lighting, shadows, reflections, depth of field) and a casual view of the shoot might not reveal inconsistent lighting, movement, or shadows that are not realistic.	Advanced modifications were applied to achieve realism (lighting, shadows, reflections, depth of field) and even a dedicated view of the shoot might not reveal inconsistent lighting, movement, or shadows that are not realistic.	
				Total Rubric Score	

Standards Mapping

ISTE Standards

Empowered Learner

1a: Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.

1b: Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways.

1c: Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

Knowledge Constructor

2a: Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.

Innovative Designer

3a: Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems.

3b: Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

3c: Students develop, test, and refine prototypes as part of a cyclical design process.

3d: Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems.

Creative Communicator

4a: Students create original works or responsibly repurpose or remix digital resources into new creations.

4b: Students publish or present content that customizes the message and medium for their intended audiences.

Common Core Standards

CSS.MATH.CONTENT.7.G.A.2

Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions.

CCSS.MATH.CONTENT.8.G.A.1

Verify experimentally the properties of rotations, reflections, and translations.

CCSS.MATH.CONTENT.8.G.A.2

Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

National Core Arts Standards

MA:Cn11.1.7a

Research and demonstrate how media artworks and ideas relate to various situations, purposes, and values, such as community, vocations, and social media.

MA:Cn11.1.8b

Analyze and responsibly interact with media arts tools, environments, legal, and technological contexts, considering ethics, media literacy, social media, and virtual worlds.

MA:Cn11.1.IIIa

Demonstrate the relationships of media arts ideas and works to personal and global contexts, purposes, and values, through relevant and impactful media artworks.

MA:Cn11.1.IIIb

Critically investigate and strategically interact with legal, technological, systemic, and vocational contexts of media arts.

MA:Pr6.1.6a

Analyze various presentation formats and fulfill various tasks and defined processes in the presentation and/or distribution of media artworks.

MA:Pr6.1.6b

Analyze results of and improvements for presenting media artworks.

MA:Pr6.1.7a

Analyze various presentation formats and fulfill various tasks and defined processes in the presentation and/or distribution of media artworks.

MA:Pr6.1.7b

Analyze results of and improvements for presenting media artworks.

MA:Pr6.1.8a

Design the presentation and distribution of media artworks through multiple formats and/or contexts.

MA:Pr6.1.8b

Evaluate the results of and implement improvements for presenting media artworks, considering impacts on personal growth and external effects.

MA:Pr6.1.Ia

Design the presentation and distribution of collections of media artworks, considering combinations of artworks, formats, and audiences.

MA:Pr6.1.IIa

Curate and design the presentation and distribution of collections of media artworks through a variety of contexts, such as mass audiences, and physical and virtual channels.

MA:Pr6.1.IIIa

Curate, design, and promote the presentation and distribution of media artworks for intentional impacts through a variety of contexts, such as markets and venues.

MA:Pr4.1.7

Integrate multiple contents and forms into unified media arts productions that convey consistent perspectives and narratives, such as an interactive video game.

MA:Pr4.1.I

Integrate various arts, media arts forms, and content into unified media arts productions, considering the reaction and interaction of the audience, such as experiential design.

MA:Pr5.1.6

Develop a variety of artistic, design, technical, and soft skills through performing various assigned roles in producing media artworks, such as invention, formal technique, production, self initiative, and problem-solving.

MA:Pr5.1.7

Exhibit an increasing set of artistic, design, technical, and soft skills through performing various roles in producing media artworks, such as creative problem solving and organizing.

MA:Pr5.1.8

Demonstrate a defined range of artistic, design, technical, and soft skills through performing specified roles in producing media artworks, such as strategizing and collaborative communication.

MA:Pr5.1.I

Demonstrate progression in artistic, design, technical, and soft skills as a result of selecting and fulfilling specified roles in the production of a variety of media artworks.

MA:Pr5.1.II

Demonstrate effective command of artistic, design, technical and soft skills in managing and producing media artworks.

MA:Cr2.1.6

Organize, propose, and evaluate artistic ideas, plans, prototypes, and production processes for media arts productions, considering purposeful intent.

MA:Cr2.1.7

Design, propose, and evaluate artistic ideas, plans, prototypes, and production processes for media arts productions, considering expressive intent and resources.

MA:Cr2.1.8

Structure and critique ideas, plans, prototypes, and production processes for media arts productions, considering intent, resources, and the presentation context.

MA:Cr2.1.I

Apply aesthetic criteria in developing, proposing, and refining artistic ideas, plans, prototypes, and production processes for media arts productions, considering original inspirations, goals, and presentation context.

MA:Cr2.1.II

Apply a personal aesthetic in designing, testing, and refining original artistic ideas, prototypes, and production strategies for media arts productions, considering artistic intentions, constraints of resources, and presentation context.

MA:Cr2.1.III

Integrate a sophisticated personal aesthetic and knowledge of systems processes in forming, testing, and proposing original artistic ideas, prototypes, and production frameworks, considering complex constraints of goals, time, resources, and personal limitations.

Next Generation Science Standards

HS-ETS1-1

Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2

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

HS-ETS1-3

Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

HS-ETS1-4

Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Accommodations and Modifications

Modifications for students with Individual Education Program plans (IEPs) may include extended time to complete the lesson and planned, frequent breaks during the video tutorials and use of Unreal Engine. For students without access to the required technology, they may be asked to simply watch the tutorial videos and write a short essay on the key features of Unreal Engine, its use in a variety of industries, and how to create, design, and render a project through Unreal Engine and Sequencer.

If needed or desired, the challenge of the lesson may be increased by asking students to devise their own design challenges (increased camera angles/ activity, additional or more sophisticated animation, etc.). They may also be directed to the use of inquiry to obtain additional skills within Unreal Engine, such as incorporating visual scripting through Blueprint to make the level interactive or including artificial intelligence through Behavior Trees.

Resources

- **"Sequencer Overview."** ***Unreal Engine Documentation.***
- **"The Art of Lighting | Pixar in a Box." Khan Academy, Khan Academy.**
- **"Unreal Online Learning."** ***Unreal Engine.***
- **"Unreal Engine | YouTube channel."** ***YouTube.***