The Art & Science of Lucasfilm: StageCraft

VIEWING GUIDE

presentation overview

Industrial Light & Magic, industry leaders in the world of visual effects, have done it again by creating a start-to-finish virtual production solution called ILM StageCraft. The groundbreaking technology provides a continuous pipeline from initial exploration, scouting, and art direction, traditional and technical previsualization, lighting, and of course, real-time production filming itself, with the innovative StageCraft LED volumes. Utilizing their own career path stories and current examples of work on The Mandalorian, experienced professionals from ILM's Virtual Production Team will share their expertise in a behind-the-scenes, interactive multimedia presentation that demonstrates the intersection of art, science, and technology in the entertainment industry, all while making connections to current STEAM curriculum topics. Attendees will be able to send in questions for our guests during the Q&A portion of the program via the website.

This study guide is intended to complement The Art & Science of Lucasfilm: StageCraft presentation, but feel free to adapt and abridge the content as necessary to meet your unique learning objectives and circumstances.

Recommended Grades 6-12

about the series

The Mandalorian

As the first ever Star Wars live action series, **The Mandalorian** opened a new realm of storytelling in the Star Wars galaxy. Set between the fall of the Empire and the rise of the First Order, a lone mysterious gunfighter plies his trade deep in the galaxy's outer reaches far from the activity of the New Republic.

With a starring cast including Pedro Pascal, Gina Carano, Giancarlo Esposito, Emily Swallow, Carl Weathers, Omid Abtahi, and Werner Herzog, the unprecedented series made its world debut with the release of Disney+ in November of 2019.

The Mandalorian was written and executive produced by Emmy-nominated producer and actor Jon Favreau. Lucasfilm veteran Dave Filoni (**Star Wars: The Clone Wars**, **Star Wars Rebels**) directed the series premiere. Additional episodic directors include Deborah Chow (**Jessica Jones**), Rick Famuyiwa (**Dope**), Bryce Dallas Howard (**Solemates**), and Taika Waititi (**Thor: Ragnarok**).

subject areas

Arts/Media

Career Path Training

Computer Science

English Language Arts

STEAM

Peer/Youth Issues

presenter bios

Ian Milham joined Industrial Light & Magic in 2018 as a Virtual Production Supervisor, after a 24 year career in real time computer graphics. He leads the on stage team of artists operating the Stagecraft system in its first major deployment on Season One of The Mandalorian. Ian got his start as an environment artist in video games, becoming an Art Director and Creative Director on several titles. He was nominated for Best Real-Time visuals by the Visual Effects Society and a BAFTA for Outstanding Visual Achievement for Dead Space.

Ciku Karanja is a technology project manager for Lucasfilm's virtual production teams. For the past eight years, she has worked with filmmakers, actors, creatives, and engineers across the Bay Area. She has a Master's in media history, enjoys exploring narrative as it relates to audience, society, and power, and is intrigued by cinematic innovations as definitive and disruptive milestones in our future histories.

Eoghan Cunneen is a Virtual Production Computer Graphics Supervisor and Content Pipeline Engineering Manager at Lucasfilm's Advanced Development Group, a research and development group within Lucasfilm that focuses on real-time computer graphics that drive ILM's virtual production and ILMxLAB's immersive experiences. He focuses on software development and infrastructure to optimize the production process.

discussion questions

Did you enjoy this presentation? What were your favorite moments?

Before this presentation, did you know what goes into making a heavily VFX focused show like **The Mandalorian**? What did you learn about **The Mandalorian'**s VFX process that you did not know before?

If you previously watched **The Mandalorian** before this presentation, did you know it was shot with new LED screen technology instead of traditional green screens? Do you think the show would have looked different if it was shot using mostly green screen technology? What do you think would have been different?

Do some research on other new VFX technologies that Lucasfilm has used in its productions over the course of its existence. What other technologies did Lucasfilm and its partners help popularize? How do those past technologies compare to current day VFX technology?

Why do you think it's important for VFX artists to continuously be trying new things and exploring new technology?

Compare and contrast the Unreal Engine and LED Screen technology with Green Screen technology. What are the pros and cons to each kind of technology?

How do you think the Unreal Engine and LED Screen technology can change the film industry? What are your predictions on how these technologies will be used in the future?

Unreal Engine technology was created by Epic Games — an American video game and software developer and publisher — to be used in its video games. Now that the technology is being used to improve VFX in filmmaking, do you see a future where video games and film become more intertwined? Why or why not? What do you think that future will look like?

Are you interested in working on VFX in films? Why?

What new skills and competencies will filmmakers of the future need that are different from what they needed in the past?

Compare the skills and experiences of the presenters from their bios. What patterns do you see in their career paths? What surprised you? What questions do you have for them?

How did the presenters explain how STEAM plays into their jobs? What kind of math and science training would you need to prepare for work in this field?

John Favreau's innovative approach to **The Mandalorian** drove the advancement of ILM StageCraft to great success. An end-to-end virtual production solution, ILM StageCraft is a methodology that allows filmmakers unparalleled creative control and collaboration during prep and shoot, which is a game-changer on a huge visual effects driven series like **The Mandalorian.** Instead of the traditional green screen and post visual effects paradigm, ILM StageCraft enables principle photography on photo-real, virtual sets that rendered in real-time and indistinguishable from their physical counterparts. This provides an immersive experience for actors and filmmakers, seamless interactive light on the physical elements on set, and literally thousands of in-camera VFX finals. It's had a profoundly positive impact on every aspect of our production."

- Janet Lewin, Co-Producer, **The Mandalorian**

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activities

VFX Storyboarding

Watch this short video titled "Intro to Storyboarding". Pay attention to the explanation of how storyboarding has changed as VFX have evolved over time. How do you think the Unreal Engine and LED Screen Technology will change how filmmakers plan their storytelling?

Green Screen Technology

Try out green screen technology for yourself! Green Screen by Do Ink is a cheap, easy, beginner app for testing out a green screen.

LED Screen Technology

Try to re-create the new LED screen technology used in the Mandalorian. You can create a mini version of this technology using a recording device (a camera or smartphone) and a monitor (from a computer, laptop, or TV). Create a miniature character or several characters, and find a video or photo that you want to use as your set background. Pull that photo or video up on your monitor, and set up your characters in front of it. Take your recording device and create a shot where the character seamlessly blends in with your digital background. Play around with the lighting from the monitor and the lighting in your environment and make your own scene with your character(s).

Unreal Engine

Did you know Unreal Engine is free to use? If you are interested in VFX design or video game design you can give it a try here. There are even free tutorials created by Epic Games that can help you learn to use the platform.

additional resources

Unreal Engine

The Virtual Production of The Mandalorian, Season One

Why 'The Mandalorian' Uses Virtual Sets Over Green Screen

Understanding 'The Volume,' The Technology That's Changing VFX Production

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nellie wong magic of movies essay contest

This contest is made possible by the generous support of the Nellie Wong Magic of Movies Education Fund, endowed by Tim Kochis and SFFILM board member Penelope Wong to honor the memory of her mother, Nellie Wong (1917-2007), who was an avid film-goer and cinephile. Developed to support the year-round outreach efforts of SFFILM Education, the Fund aims to cultivate students' imaginations, enhance their critical thinking and creative writing skills and instill a greater appreciation for the magic of movies in young audiences of the Bay Area.

Winning essays will be determined based on creativity, depth, enthusiasm, clarity, grammar and relevance to the essay prompts. Essays must be written in response to one of the following questions about the The Art & Science of Lucasfilm: StageCraft presentation. There is no minimum word or page count for this contest, instead students should focus on crafting a thoughtful and complete response to their selected prompt. Essays should be no longer than 3 pages.

Prompts

1. Did this presentation make you think differently about your own career trajectory? Did it make you think differently about how you might use your skills in either math, science, or art in your future career? Think about the experiences that led these presenters toward working for Lucasfilm. Have you had an experience in your own life that inspired you toward a particular kind of work? Imagine and describe a future in which that experience leads you into the career of your dreams.
2. The speakers from Lucasfilm presented about the new technology that was used to make **The Mandalorian**, and how it has the ability to shape the future of VFX within the filmmaking industry. Is there a new, emerging technology that you think will redefine an industry or way of life (i.e. new tech in transportation, environmental science, storytelling, sports, medicine, etc)? Write about this new technology and how you think it will reshape our world.
3. Use your imagination to create a new story world of your own. Introduce us to your story world and then explain how you would bring your world to life on screen using new VFX technology. If you had an unlimited budget, would you use LED Screen Technology, Unreal Engine, Green Screens, or something completely different?
4. Watch an episode of **The Mandalorian** through the lens of a film critic. Think back to what you learned about the technical process that went into creating the series. How do these new technological advancements change the viewing experience for the audience? Pay attention to things like lighting, mood, emotion, acting, pacing, and editing, and analyze how new technology made these aspects of the episode different than other Star Wars films.
5. Write about your experience on this digital field trip. Did you enjoy this presentation? What were your favorite moments? Was there a subject that one or more of the presenters touched on that was extra interesting to you? Do some more research on that subject and tell us what you learn.

Submissions

Please email all submissions to education@sffilm.org with "Lucasfilm Essay Contest" in the subject line. To be eligible for consideration, all essays must include the following information:

• Student name
• Grade
• School
• Teacher name
• Teacher email address

Deadline for entry is Jan 5th 2021 at 11:59 PM .

Prizes

• Elementary School, Grades 1-5
      $150 cash prize
• Middle School Grades 6-8
      $300 cash prize
• High School Grades 9-12
      $500 cash prize

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vfx glossary

CHARACTER ANIMATION
A specialized area of the animation process, which involves bringing animated characters to life. Character Animators must create the illusion of thoughtfulness, emotion and personality by developing every character's appearance, body language and facial expressions from scratch. While an actor generally provides the vocals in an animated film performance, the character animator provides all else.

COMPOSITING
The combining of visual elements from separate sources into single images, often to create the illusion that all those elements are parts of the same scene or space.

CREATURE ANIMATION
Not unlike character animation, creature animation is the process of bringing animated beasts, aliens and animals to life.

FACIAL ANIMATION
The detailed process of animating characters' facial features to convey particular appearances, emotions, reactions, etc.

GREEN SCREEN
A special effects film technique involving filming actors against a green screen on which effects such as computerized graphics can be added later and integrated into a single sequence..

MOTION CAPTURE
A process by which patterns of movement are captured via a series of sensory nodes applied to various body/face parts of a live actor; these nodes record data about the spatial configuration of these nodes over time; simulation software then processes these data and applies them to a virtual actor on a computer.

MOTION CONTROL
A process that generally utilizes robotic camera mounts, enabling identically configured and timed camera movement on every take. This process facilitates digital compositing on shots that involve camera movement, as it eliminates the many variables of human camera operation.

PHOTOGRAMMETRY
The age-old practice of determining the geometric properties of objects based on photographic images.

ROTOSCOPING
An animation technique in which live- action video is traced and "painted" to create 2-D animation that mimics the live-action.

UNREAL ENGINE
The Unreal Engine is a game engine developed by Epic Games, first showcased in the 1998 first-person shooter game Unreal. Today Unreal Engine is the world's most open and advanced real-time 3D creation tool. Continuously evolving to serve not only its original purpose as a state-of-the-art game engine, today it gives creators across industries the freedom and control to deliver cutting-edge content, interactive experiences, and immersive virtual worlds.

VIRTUAL CINEMATOGRAPHY
The process of creating the illusion of camera movement by digitally compositing and sequencing background images that change position relative to live action footage.

VIRTUAL SET
A 3D software module that collates and arranges a massive series of images according to the spatial organization and geometry of a given scene setting such that live action green screen footage of actors can be dynamically combined with the virtual space. In the case of **The Mandalorian**, the virtual set consisted of an immersive and massive 20' high by 270-degree semicircular LED video wall and ceiling with a 75'-diameter performance space, where the practical set pieces were combined with digital extensions on the screens. Digital 3D environments created by ILM played back interactively on the LED walls, edited in real-time during the shoot, which allowed for pixel-accurate tracking and perspective-correct 3D imagery rendered at high resolution.

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lucasfilm overview

Lucasfilm

Lucasfilm Is Among The World's Leading Entertainment Service Companies, A Pioneer In Visual Effects And Sound Across Multiple Mediums, And Is Home To The Legendary Star Wars And Indiana Jones Franchises.

Founded by visionary filmmaker George Lucas in 1971, Lucasfilm established itself as a "rebel base" of sorts in San Francisco's Bay Area, a place the filmmaker chose to "shake up the status quo…of how movies were made and what they were about." It was a defiant departure from the Hollywood mainstream and a more conducive atmosphere to cultivate his independent spirit of filmmaking.

Basing his Skywalker Sound facility at the Ranch, Lucas moved Industrial Light & Magic, his special effects company based in Los Angeles, to nearby San Rafael, allowing him to keep his production facilities and special effects house in close proximity to each other.

In 2005, Lucas brought Lucasfilm and Industrial Light & Magic together at the Letterman Digital Arts Center at the Presidio in San Francisco. Six years later in 2012, he handed the company reigns over to renowned producer Kathleen Kennedy, who has since opened up an exciting new era for Lucasfilm by returning it to its production studio roots.

When Lucasfilm was acquired by Disney that same year, Kennedy worked to enhance the company's collaborative spirit, building a creative community of writers, directors, artists and filmmakers. Lucasfilm draws on the vast pool of skilled, world-class talent found in San Francisco and around the world, allowing it to create the top-notch entertainment experiences it has come to be known for.

Industrial Light and Magic

Founded in 1975 by George Lucas, ILM is the leading effects facility in the world, serving the motion picture, commercial production, and attraction industries. ILM has created visual effects for over 325 feature films and has played a key role in

seven of the top 10 worldwide box-office hits of all time and has contributed to 25 of the top 50.

ILM has set the standard for visual effects, creating some of the most stunning images in the history of film. At the forefront of the digital revolution, the company continues to break new ground in visual effects, VR, AR, and Immersive Cinema. The company has been awarded 15 Academy Awards for Best Visual Effects and received 31 Academy Awards for Scientific and Technical Achievement.

Skywalker Sound

The pulsating hum of a lightsaber. The thunderous footsteps of a stalking Tyrannosaurus Rex. The awesome roar of Star-Lord's Milano. For more than a generation, Skywalker Sound has created soundscapes that have redefined aural immersion.

With origins based in Ben Burtt's landmark work on 1977's Star Wars, Skywalker Sound specializes in sound design, mixing, and audio post-production across multiple mediums. From the gathering of real-life, organic sounds to developing new techniques in sound presentation, Skywalker Sound remains one of the world's most innovative facilities — eager to explore, create, and venture into the unknown.

ILMxLAB

Lucasfilm's award-winning immersive entertainment studio, pioneering a new era of interactive storytelling through virtual and mixed reality experiences. Working with acclaimed creators and designers, we create living worlds, inviting you to step inside and become the hero of your own personal adventure.

common core standards

Science and Technical Subjects

CCSS.ELA-LITERACY.RST.6-8.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

CCSS.ELA-LITERACY.RST.6-8.9

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

CCSS.ELA-LITERACY.RST.9-10.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

CCSS.ELA-LITERACY.RST.11-12.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

CCSS.ELA-LITERACY.RST.11-12.9

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Writing

CCSS.ELA-LITERACY.WHST.6-12.1

Write arguments focused on discipline-specific content.

CCSS.ELA-LITERACY.WHST.6-12.2

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

CCSS.ELA-LITERACY.WHST.6-12.6

Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

CCSS.ELA-LITERACY.WHST.6-12.7

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

CCSS.ELA-LITERACY.WHST.6-12.8

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

CCSS.ELA-LITERACY.WHST.6-12.9

Draw evidence from informational texts to support analysis, reflection, and research.

media literacy resources: screening with meaning

We live in a world where technology mediates a large portion of human interaction and the exchange of information. Every projected image, every word published on a page or a website, and every sound from a speaker reaches its audience through the medium, through the language of the device. The ability to parse the vast array of media messages is an essential skill for young people, particularly in a mainstream commercial culture that targets youth as a vulnerable, impressionable segment of the American marketplace. Most students already have a keen understanding of the languages different media use and the techniques they employ to inspire particular emotions or reactions, but they often lack the skill or awareness to fully deconstruct the messages they continuously receive. Analysis of a media message—or any piece of mass media content—can best be accomplished by first identifying its principal characteristics:

(1) Medium: the physical means by which it is contained and/or delivered

(2) Author: the person(s) responsible for its creation and dissemination

(3) Content: the information, emotions, values or ideas it conveys

(4) Audience: the target audience to whom it is delivered

(5) Purpose: the objectives of its authors and the effects of its dissemination.

Students who can readily identify these five core characteristics will be equipped to understand the incentives at work behind media messages, as well as their potential consequences. Media literacy education empowers students to become responsible consumers, active citizens and critical thinkers.

common core standards

MEDIUM
All Media Is Constructed.

• What is the message, how is it delivered and in what format?

• What technologies are used to present the message?

• What visual and auditory elements comprise the media content?

• What expectations do you bring to the content, given its medium and format?

CONTENT
Media Is A Language For Information.

• What is the subject of the media message?

• What information, values, emotions or ideas are conveyed by the media content?

• What tools does the author employ to engage the viewer and evoke a response?

• To what extent did the content meet your expectations, given the format/author?

PURPOSE
All Media Messages Are Constructed for a Reason.

• Why was the message constructed?

• Who benefits from dissemination of the message? How?

• To what extent does the message achieve its purpose?

• What effect does the message have on the audience it reaches, if any?

AUTHOR
All Media Is Constructed by Someone.

• Who is delivering the message?

• Who originally constructed the message?

• What expectations do you have of the content, given its author(s)?

AUDIENCE
All Media Messages Reach an Audience.

• Who receives the message?

• For whom is the message intended?

• What is the public reaction to the media content and/or its message?

• What is your reaction to the media content and/or its message?

• How might others perceive this message differently? Why?

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