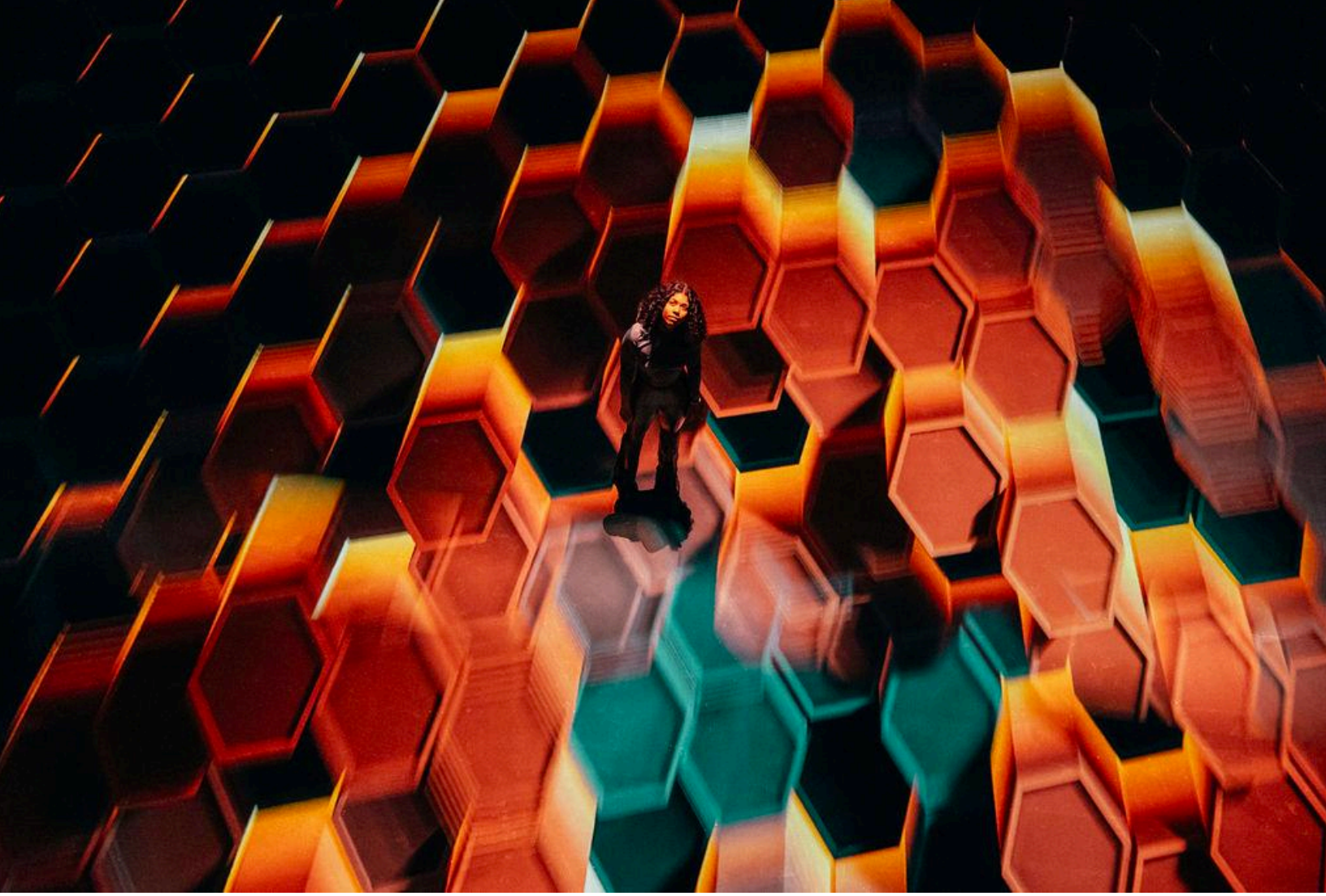


Mesh

Media Experience Service Hub, a new XR work-integrated learning initiative at MIX Center

Herberger Institute for Design and the Arts
Arizona State University

ASU Mesh Program

Executive Summary

ASU Mesh advances XR production and education to supercharge Arizona State University research and education through immersive, spatial, interactive, gamified experiences. Based at ASU Herberger Institute of Design and the Arts (HIDA), Mesh consists of:

(i) Mesh Projects, creative production to develop XR content for internal and external clients; and
(ii) Mesh Guilds, a network for upskilling students to learn at the intersection of the skills of the future.

Through Mesh, ASU learners access and apply competency in collaborative art, design, and engineering.

Projects: Mesh as XR Creative Production Agency

Mesh provides XR project services to academic units, research projects, and community partners. Mesh builds and uses templatized processes for project intake, execution, and IP arrangements, ensuring efficient project delivery. Projects are produced by a creative workforce of students across multiple ASU programs, overseen by Mesh staff and associated faculty. Mesh serves as a model of the cross-disciplinary team environment of creative production houses.

Mesh product categories include:

- Narrative Experiences
- Virtual Classrooms in VR and AR
- Immersive 360-degree Videos
- Immersive Environments and Scenarios
- 3D + 2D Data Visualization

Guilds: Mesh as Upskilling, Social, Support, and Talent Pool

The Mesh Guild System gathers XR practitioners into role-oriented guilds. Each guild weaves like-minded XR practitioners (both novices and experts) across the university for synergistic collaborative sharing of experience: successes, challenges, strategies, etc. Mesh Guilds stay abreast of the latest advancements in the craft, and prepare students for work upon graduation. The guilds are also a great place for our partners to source talent who will work in AR/VR in a variety of industries, and participate through mentorship, workshops, and guest learning sessions.

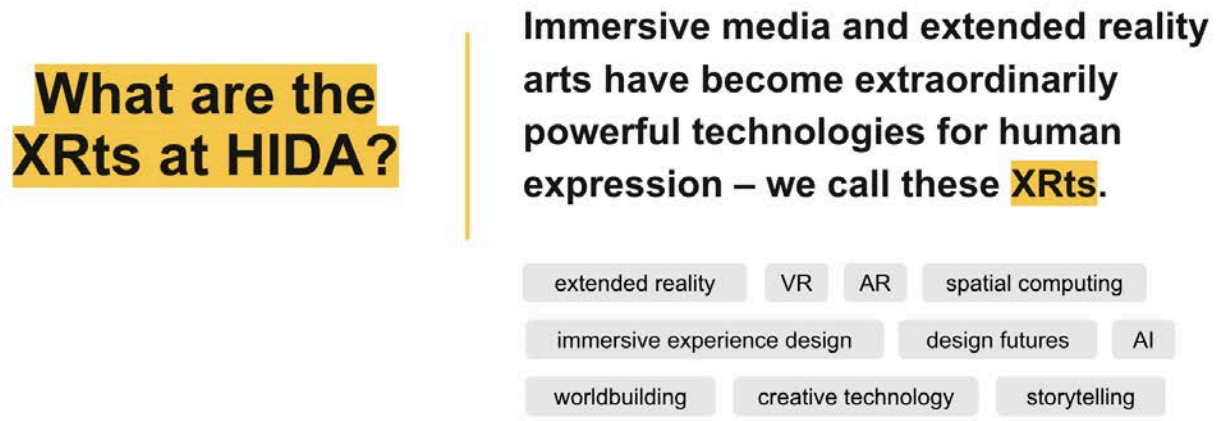
Mesh Guilds include:

- Project Management
- 3D Modeling and Animation
- Narrative/Concept/Learning Design
- Avatars and Characters
- Spatial/Game Engine Integration
- Multiplayer and Cloud Systems
- Interaction & Level Design
- Spatial Sound Production

Mesh Projects draw team members from multiple Mesh Guilds, fostering cross-functional teaming to accomplish high quality XR work.

How Mesh empowers XR at ASU

- **Centralized XR Production Services:** Mesh is a one-stop shop for XR project needs. We make sure projects come to life smoothly and within budget. Scalable cost reduction allows academic units and researchers to budget for immersive experience development.
- **Templatized Processes:** Standardized processes for project intake, execution, and IP arrangements ensure that every project is delivered consistently and efficiently.
- **Faculty Research Support:** Faculty members across the university can tap into Mesh Guilds to hire production talent. This allows them to pursue broader funding opportunities, enriched with XR, e.g., for broader impacts through communication of research outcomes.
- **Cross-Functional Collaboration:** Project teams draw from multiple Mesh Guilds. The intersections of different disciplines come together to create groundbreaking XR projects.
- **Student Career Development into Creative Workforce:** Learners' technical skills and competencies learned at ASU find application in real-world work-based learning environments, developing student leadership, teamwork competencies, rich portfolios, and confidence in ability.
- **Attraction of Recruitment into ASU MIX Master's Programs:** Our visually captivating products show prospective ASU students what they might be capable of and the potential for developing advanced skill sets. Success at Mesh is also a great marketing tool for our academic programs in MIX, AME, and HIDA.
- **Ongoing Mentorship:** Mesh Guilds provide ongoing mentorship to students, including those operating outside of the faculty's expertise. The guilds also provide a social layer of support for like-minded XR practitioners.



Mesh Lab Production Processes

Mesh Lab specializes in the development of immersive training and education modules at many levels, including for grade school, college-level, and corporate workforce training. We design the production process to optimize for curricular alignment, high creative/technical quality, and affordable production. This is achieved through the creation of template platforms and production processes.

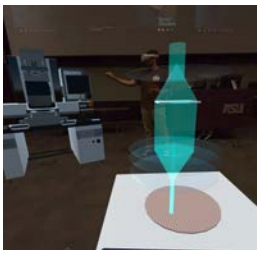
Mesh Leadership forms project teams from students from Mesh Guilds. This allows the project to leverage each student's role-oriented skills and competencies, as well as each guild's continual network of technical support and creative inspiration for the student's responsibilities. The team meets weekly to delegate tasks and co-design with clients and other stakeholders. Additional subteam meetings for engineering, design, and artistry facilitate iterative project development.

A Mesh Lab Producer (staff) oversees each project to ensure accountability to client expectations, including delivery timing, quality, and alignment to client needs. While the project execution is student-driven, the Producer serves as a first-line of defense to ensure reliability, and reports directly with Mesh Leadership to connect resource needs and respond to personnel challenges. The Producer also serves as a single point of contact for stakeholders throughout a project's timeline.

Virtual Classrooms in VR and AR

Teaming Roles: 8 Students: 1 Project Manager, 3 Developers, 3 Artists, 1 Audio
Development Lifecycle: 3 - 6 months

Through Virtual Reality, instructors take learners to virtual spaces for interactive conversations in shared learning environments. Alternatively, through Augmented Reality, instructors can bring virtual objects into a learner's view of their physical space. In both forms of virtual classrooms, students can see and interact with each other and have interaction with various virtual elements in the scene. The instructor has control to activate different elements, including object appearances, animations, and scene transitions.



Case Study: Headset-based AR Semiconductor Metrology Classroom

Arizona's rapid growth in semiconductor manufacturing, marked by substantial investments in new facilities, has created a pressing need for a skilled workforce to operate these advanced fabrication plants. This demand extends to both college learners seeking high-tech careers and non-college-educated individuals looking to upskill for in-demand jobs.

Mesh Lab is developing an AR-based semiconductor metrology training program that provides virtual experience with equipment processes and semiconductor physics principles that are critical to understanding the semiconductor manufacturing process. Through Quest 3 headsets, users will still be able to see the physical classroom around them, but also have interactive spatial models of curricular content on their desks and alongside the instructor.

In Fall 2024, we will roll out a pilot version of the AR Classroom for Semiconductor Metrology in EEE 598: Metrology for Semiconductor Devices, taught by Professor Umberto Celano. Contextualized in the class, we plan to conduct user studies on learner discovery and retention of knowledge of the spatial concepts.

Narrative Experiences (Seated or Standing)

Teaming Roles: 12 Students: 1 Project Manager, 4 Developers, 4 Artists, 2 Narrative, 1 Audio,
Development Lifecycle: 6 - 9 months

In a single-player, narrative-driven virtual reality experience, students are immersed in a structured learning environment from the perspective of their avatars. This asynchronous experience can be customized for cross-platform integration through the Dreamscape platform, enabling diverse learning opportunities for students. Curricularly aligned questions can be interspersed through the narrative, engaging students to think critically to answer.

Case Study: Hurricane Heroes for GPH 214: Introduction to Meteorology

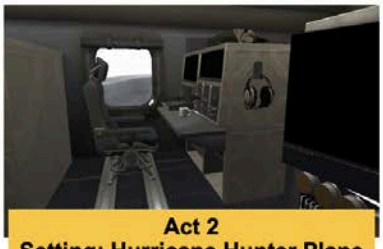
Course objectives for GPH 214 include the understanding of weather formation and the use of scientific weather data to drive decision-making and public policy. The course also seeks to emphasize the need for proper safety measures. The project ideation emerged from conversation with Christine Moore, Instructional Designer from EdPlus, and course instructor Rachael Kaye, a 2-time Emmy award winning broadcast meteorologist.

Mesh produced Hurricane Heroes, a 3-act virtual reality interactive narrative experience that places the student in the shoes of three critical roles around a major storm.

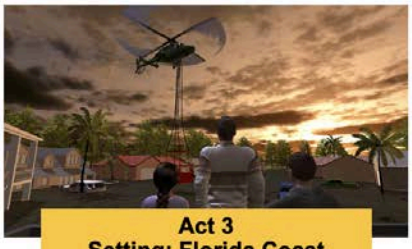
- Act 1: Broadcast meteorologist convincing viewers to evacuate before a hurricane hits
- Act 2: Weather science officer collecting valuable data from the eye of the storm
- Act 3: Emergency rescue support in the wake of the hurricane's destruction

Kaye deployed the use of Hurricane Heroes in screen-based and VR-based form factors in GPH 214 online courses in Summer 2023 and 2024. User studies have indicated success in measured learning outcomes through student feedback and self-efficacy reports. The team published and presented research outcomes in the iLRN (Immersive Learning Research Network) 2024 conference.

Act 1
Setting: Newsroom
Role: Weather Producer



Act 2
Setting: Hurricane Hunter Plane
Role: Dropsonde Officer



Act 3
Setting: Florida Coast
Role: Rescue Operator

Learning Objectives:

LO1 - Identify the structure and impacts of various hurricanes.

LO2 - Recognize what weather information is distributed to the public from the National Hurricane Center.

LO3 - Explain the steps a meteorologist takes in a typical workday, including tools used.

LO4 - Describe sources of uncertainty in forecast communication.

LO5 - Interpret weather data used by forecasters, such as observation data.

LO6 - Explore plausible forecasts and storm safety assumptions as a means of making decisions.

LO7 - Explain how meteorology can be applied to real life scenarios.

Immersive 360-degree Videos

Teaming Roles: 8 Students: 1 Project Manager, 1 Creative Director, 3 Film Editors, 2 Artists, 2 Audio
Development Lifecycle: 3 - 6 months

360-degree videos allow learners to freely look in any direction of a fully immersive environment. The videos can include camera-based captures of real environments, rendered virtual environments, or a fusion of both. We have developed a synchronous playback system that allows a classroom of headsets to watch the same 360-degree videos at the same time, controlled by an instructor.

Case Study: Act One Season 2

Mesh has partnered with Act One, a local non-profit, to help them offer Arts Immersion VR field trips for students (grades 8-12) to explore arts culture from their classrooms. Through Act One, the season is projected to be viewed by over 12,000 students each year through the course of over 40 field trips.

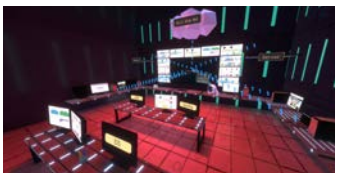
The team produced three 8-minute chapters, each highlighting an indigenous artist in Arizona, speaking to their journey as artists. Mesh collaborated with the client from concept, to artist selection, to final launch of the experience for use across the state.

Mesh engineered the Immersive Media Player System (IMPS), which allows Act One's VR specialists to manage the synchronized play of a chapter across a classroom of headsets. VR Specialists can play, pause, or select adapted chapters to aid in accessibility, all from an IMPS Tablet interface.

Exploration Games

Teaming Roles: 9 Students: 1 Project Manager, 3 Developers, 3 Artists, 1 Narrative, 1 Audio
Development Lifecycle: 6 - 9 months

Gamified learning experiences with explorable virtual rooms and interactive exhibits can promote student understanding, e.g. of an industry and potential career paths within it. Gamified elements, such as challenges and rewards, enhance learner engagement, making the learning process both enjoyable and effective. Through AI, explorable systems can also tailor to student interests.



Case Study: Career XRcade: Cybersecurity Land and Esports Land

Career XRcade is an explorable VR-based and screen-based experience including gamified exhibits that illuminate concepts relating to career paths inside of Cybersecurity and Esports. The project was developed in partnership with Edson E+I and Verizon Innovative Learning, with subject matter experts in cybersecurity and esports industries. The aim of the collaboration is to inspire high schoolers to imagine their future selves in future careers, discovering skills and competencies that resonate with their interests. The project was successfully deployed and was demonstrated at Games 4 Change in New York City. Verizon is currently deploying these experiences to high schools nationwide.

Immersive Environments and Scenarios

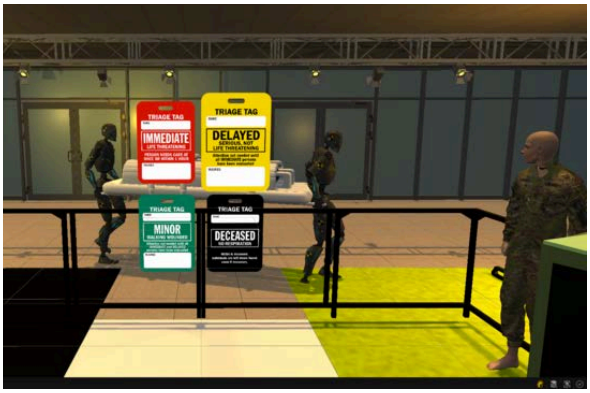
Teaming Roles: 4 Students: 1 Project Manager, 1 Developer, 2 Artists
Development Lifecycle: 3-6 months

Virtual settings can serve as the background for various scenarios, such as training simulations or research studies. Scenarios can be interactive, allowing users to engage with virtual objects and characters, or they can be passive, providing an unguided experience. Mesh can help faculty create environments to conduct research or education in a controlled and immersive setting. Such scenarios can be instrumented to track interactions, serving as a testbed for quantitative research measures.

Case Study: Synthetic Environments for Team Training of Combat Medics in Triage Scenarios

In collaboration with ASU Polytechnic faculty Scotty Craig, Jamie Gorman, and Kevin Gary, this project studies the development of experiential team training modules within a synthetic training environment. Mesh has constructed a Unity framework to record and measure team member interaction with the environment and with one another in simulated settings, reading out to an existing Generalized Intelligent Framework for Tutoring (GIFT) to assess and improve the ability of individual team members. This project is funded by the U.S. Army.

Mesh worked with the U.S. Army Soldier Center Simulation and Training Technology Center to prepare Synthetic Training Environments that represent areas and scenarios for combat medic training around casualty collection points. Trainees are expected to effectively handle a charged, urgent situation by triaging, treating, documenting, and coordinating the transition of casualties. They must quickly assess and prioritize casualties, administer immediate care, manage casualty flow, and maintain communication, requiring them to work as an adaptive, cohesive team under pressure.



3D + 2D Data Visualization

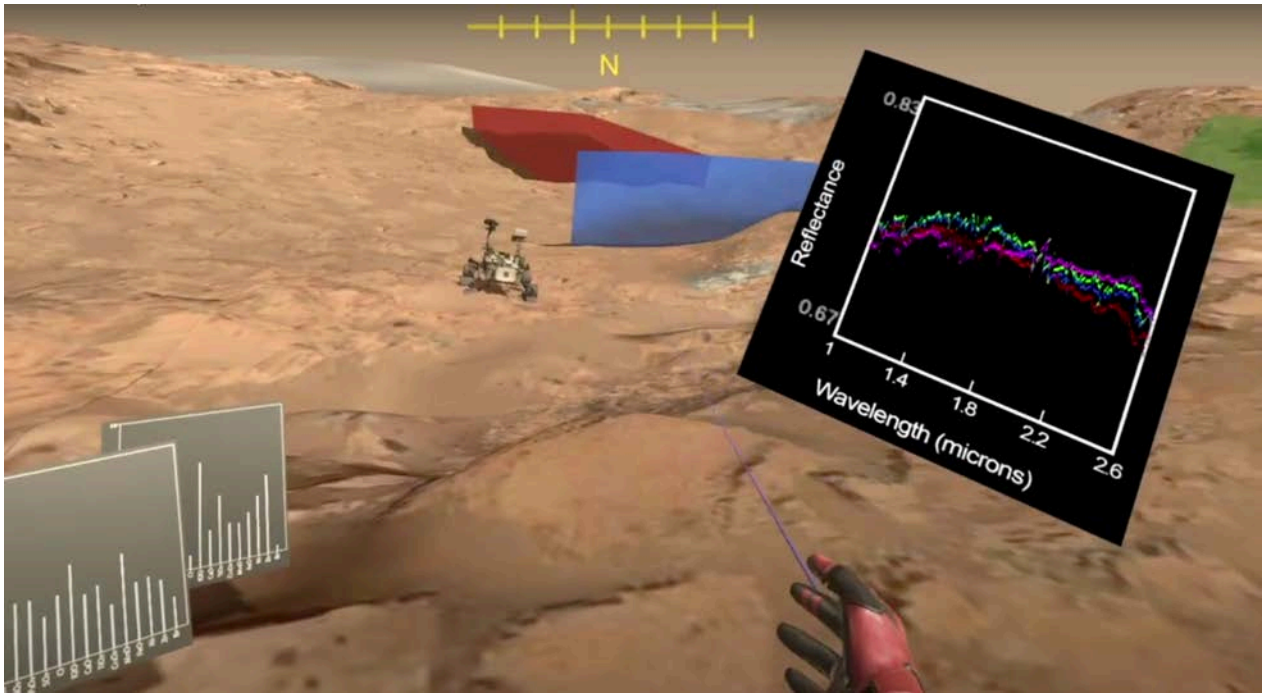
Teaming Roles: 4 Students: 1 Project Manager, 2 Developers, 1 Artist
Development Process: 3-6 months

3D + 2D data visualization transforms complex datasets into interactive visual representations. By leveraging 3D models, animations, and 2D graphical elements, abstract concepts can be brought to life, enhancing comprehension and engagement. Users can explore different perspectives, identify patterns, and draw insights. Our prior work has included GIS map-based visualizations of energy use data, overlays of planetary science data from Mars rovers and orbiters, and flight trajectories of Air Force aircraft.

Case Study: Planetary Parfait - Immersive JMARS GIS Terrain Visualizer

Funded through the Interplanetary Initiative and in close partnership with the Mars Space Flight Facility at ASU, we extended the JMARS GIS application to provide immersive, spatialized communication around planetary terrain layer data for outreach, education and collaboration around terrestrial and interplanetary surfaces. Planetary Parfait allows scientists to prepare interactive layered terrains in JMARS and view them in 3D through VR, smartphone-based AR, and desktop systems. Parfait allows multiple people to join a session through a collaborative multiplayer environment, facilitating communication and education around terrain data acquired by various spacecraft.

The project supported ASU SESE demonstration booths at the Lunar and Planetary Science Conference and the American Geophysical Union Annual Meeting and provided outreach visualization for the Hope Mars Orbiter Mission. We released the software for open use on the Steam Store. We anticipate continual integration with SESE courses and planetary science conference sessions to advance scientific communication around planetary surface models.



Example 6-Month Production Timeline for Narrative Experience:

Month 1: Narrative and Visual Development

- Write the script in close collaboration with subject matter experts to ensure that the content aligns with the learning objectives.
- Create mood boards, brainstorm designs, and storyboards, then send them to the collaborators for approval.
- Develop asset lists for 3D objects, environments, and sound in preparation for the asset creation stage.

Month 2 - 3: Script Drafting and Asset Creation

- Generate the art and audio assets based on the script and asset lists.
- Collaborate with subject matter experts to ensure that the assets align with the learning objectives.
- Build the technical framework and prepare the game engine system for the next phase of integration.

Month 3 - 4: Asset Integration

- Begin to integrate the assets into the level design, following the script directions for integration.
- Optimize the technical artistry of the assets for performance and style.
- Develops both desktop and VR versions simultaneously, ensuring cross-platform accessibility.
- Conduct user research with students, instructional designers, Instructors, and industry experts for script and art feedback.

Month 5 - 6: Prototype Testing and Polish

- Collaborate with class faculty and students for feedback and testing.
- Iterate based on the feedback from user testing.
- Polish and optimize the project for broader distribution.

Mesh Project Partners and Revenue Streams

Academic Units/Courses

It is well-understood that immersive educational experiences deeply engage learners with curricular concepts. We have seen firsthand the power of immersive, interactive, spatialized, contextualized narratives compels learners to develop strong awareness of ***why*** course material matters. As academic units face enrollment challenges, there has never been a more critical time for this: engagement and personalization drive retention of students, excitement around material, and recruitment into programs. Academic units can significantly benefit from immersive storytelling, creating shared assumptions about the relevance of the course material, and inspiration towards the future careers of the learners.

Mesh works closely with academic units to develop projects that meet specific needs and budgets. Our design processes include templates to integrate faculty and instructional designers with student teams to construct relevant learning environments that align with learning objectives of the subject matter [1,2]**.** The products can integrate with courses in both in-person and online formats, with accessible options for screen-based and headset-based users. Our prior work has resulted in measurable outcomes in increased student engagement with course material and self-reported confidence around learning objectives.

We anticipate collaboration with ASU Academic Enterprise to run intake processes and design workshops to generate project opportunities.

[1] Kaye, R., Porter, A., Moore, C., Balamurugan, N., Khaleghian, H., & LiKamWa, R. (2024). Perfecting the Interdisciplinary Storm: Immersive Narrative Development Workflows in Context of Meteorology Labs. 10th In'tl Conf. of the Immersive Learning Research Network Proceedings.
[2] Khaleghian, H., Piechowicz, J., Kaye, R. and LiKamWa, R. 2024. Work-in-Progress—Career XRcade Framework: Student-Driven Collaborative Platform for Immersive Career Exploration, Insights from Stakeholders. Immersive Learning Research - Academic. 1, 1 (Jun. 2024), 41–47.

Faculty Research Support

Faculty at ASU can use Mesh to incorporate XR components into their research proposals and/or ongoing research initiatives. Research grants can include funding for the following Mesh activities:

- **Developing XR components for research proposals:** Faculty can leverage Mesh's expertise to develop XR experiences that support proposed research, increasing funding competitiveness.
- **Providing student worker support for XR projects:** Faculty with limited XR experience can access Mesh Guilds to hire production talent, enabling them to pursue broader funding opportunities enriched with XR. Students can continue participating in Mesh Guilds to retain access to technical and creative support.
- **Creating immersive environments for research:** Mesh can create virtual scenarios and environments where faculty can conduct research simulations in controlled immersive settings.
- **Communicating research outcomes:** Mesh can help faculty communicate their research outcomes to a wider audience through immersive and engaging XR experiences, broadening the impact of their work. This is particularly relevant to planning for broader impacts of proposed research agendas.

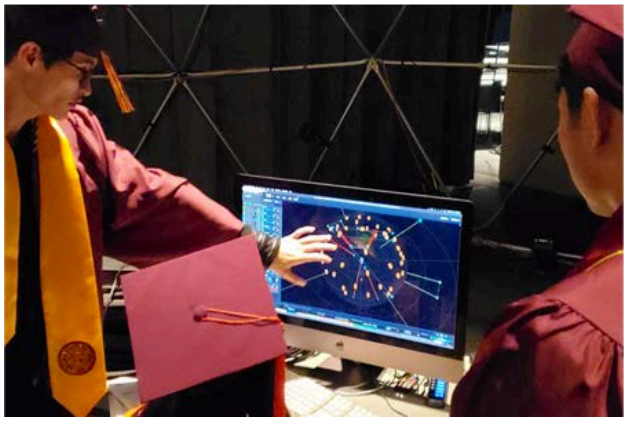
We anticipate collaboration with ASU Knowledge Enterprise to connect Mesh opportunities to large-scale research initiatives across the university.

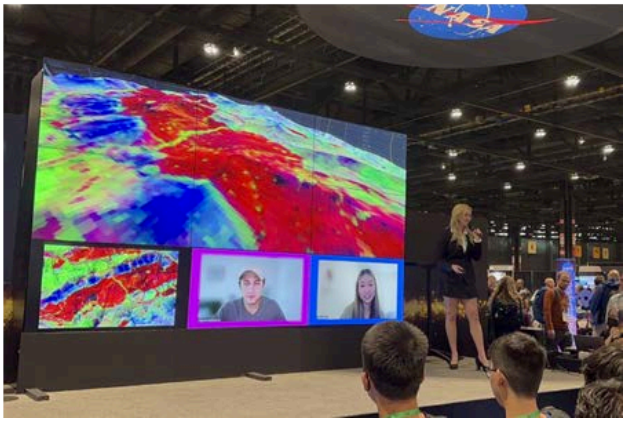
Corporate Projects

Mesh works with corporate and community clients on project-based contract work across a variety of business verticals and use cases. Training scenarios can allow employees to practice skills and competencies in virtual environments with programmable scenarios and “unsafe” environments. Digital Twins can emulate real-world signals in equipment through interactive visualization and feedback loops. Creative narrative production can engage potential employees and clients into a corporation’s brand identity. Virtual telepresence projects can connect trainers and learners for remote assistance, or provide virtual real-time visitation of hazardous or difficult-to-reach locations. Mesh will continue to work with corporations to identify various opportunities to develop project ideas and eventual contracts.

In coordination with Skysong Innovations, Mesh is developing standardized templates of non-exclusive, royalty-free license models and other IP arrangements that meet the needs of corporate clients. These can be tailored to specific needs and requirements of the corporate partner. Additionally, we collaborate with corporations to write grants, e.g., SBIR and STTR, to secure funding for joint projects.

Students from Mesh Guilds can assist industry partners and clients in understanding how XR production teams can positively impact their operations. Mesh will organize design workshops and co-imagining sessions. Furthermore, to provide real-world experience, organizations can hire student interns and full-time employees. Through these internships, students will learn how to integrate their skills and competencies into a corporate setting and offer their talents to the corporation, helping both parties embark on their XR journey.





Dreamscape Learn

Mesh operates as a creative production subcontractor for Dreamscape Learn, using the Dreamscape Software Development Kit (SDK) to construct experiences in coordination with curricular experts. Mesh students have developed strong competencies around the use of the SDK for constructing multi-sensory virtual scenarios for multiplayer use in standing free-roam environments and seated environments.

In our current working model, the Dreamscape Learn team conducts project intake processes to select projects to support. The Dreamscape Learn Team subsequently connects projects and funding to Mesh for creative production. This has resulted in Mesh production of various Dreamscape Learn projects alongside the School of Earth and Space Exploration, WP Carey School of Business, the School of Music, Dance and Theater, and The Polytechnic School.

Mesh students also create tutorial material to teach others at ASU how to create virtual worlds for the Dreamscape pods, producing targeted workshops for high school students, engineering summer camps, Dreamscape pod operators, and Dreamscape Learn leadership. Mesh has also produced curricular support for AME 494/598: Designing for Dreamscape, offered by the School of Arts, Media and Engineering.

Philanthropy

In speaking with donors and industry partners, as well as prospective and current students, there is significant interest in ensuring students are prepared for the professional world. Philanthropic investment in Mesh can support workforce development at ASU, preparing students for careers in the growing industries in XR, gaming, film and interactive entertainment. Funding can provide access to cutting-edge XR technologies and training programs, nurturing a skilled and diverse talent pipeline. Additionally, philanthropic support can fuel "arts x technology" (XRts) education initiatives, fostering creativity and innovation through immersive experiences. By investing in Mesh, donors can play a vital role in shaping the future of XR and its positive impact on student preparation, education, the arts, and the workforce.

Mesh is a proven success that responds directly to challenges students in the Arts are facing as they graduate. By collaborating with the ASU Foundation, Mesh will be an avenue for donors and investors to respond to clear needs. Mesh is an entry point for investment that can lead to future philanthropic support, as the partners continue to engage with HIDA and ASU.

Hosting donor events, such as demos, facility tours, and guild-oriented tutorials, can showcase the transformative work of Mesh. These events offer opportunities to engage with students, faculty, and industry partners, highlighting the real-world applications of XR technologies. By demonstrating the impact of Mesh, we can attract further philanthropic support for HIDA and MIX, ensuring the continued growth and success of these innovative programs.


METEOR
STUDIO

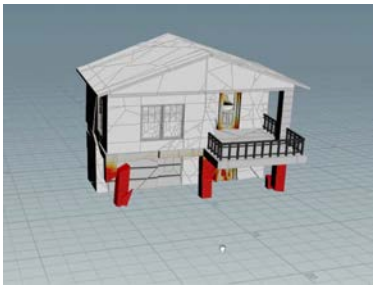

DREAMSCAPE
LEARN

Mesh Guild Structures

Mesh Guilds are collections of XR enthusiast students, staff, and faculty, organized by various role-oriented areas of XR production, e.g., 3D Modeling, Narrative Design, and Spatial Engine Integration. Each guild focuses on pertinent strategies and skills related to specific roles. Mesh projects then operate from teams of students from multiple roles to source the needs of their multiple roles. By studying and sharing in the guilds, students extend their education beyond traditional classrooms, fostering a sense of upskilling, community and collaboration around collective interests in professional settings. This allows the Mesh and other studios at ASU to execute with a higher degree of skill, quality, and competency.

Guild Charters

Each guild develops a charter that outlines the guild's purpose, learning objectives, operational framework, and team resources. The charter outlines collaborative competencies that guild members can develop, especially role-oriented communication, development, organization, and collaboration skills. In essence, the Guild Charter provides members with a roadmap of expectation, guiding members along their journey of learning, growth, and support within their guild. The Guild charter also hosts a directory of relevant experts among ASU faculty and industry practitioners for advice seeking.



For example, the 3D Modeling Guild Charter articulates the guild's focus on sculpting and animating 3D digital assets for various applications. The charter outlines the experiential learning opportunities members can expect, such as hands-on practice in 3D asset design and software use. Additionally, the charter highlights theoretical fundamentals of 3D models, materials, and animations. Finally, the charter articulates areas of potential exploration, e.g., discussions around potential opportunities, risks, and ethics of AI integration into 3D modeling workflows.

Guild Meetings

Guild meetings are held weekly, led by a student guild coordinator. Each guild meeting has 3 phases:

1. **Check-ins:** Each guild member takes 60 seconds to report on their project work as it intersects with the guild area. This allows the member to surface any issues they could use advice on, opportunities to involve other members, and celebrate incremental successes.
2. **Project Deep-Dive:** A guild member shares a 20 minute overview of the project they're hired to work on, and describes their role in the project team. The presentation delves into guild-related details, discussing tools and strategies that other members can find useful in their own projects.
3. **Technical Excursion:** A guild member leads the group in a 30-minute discussion of design strategies, AI workflow, integration, industry trends/practices, inspiring art styles, etc. This may include guest speakers who are practitioners in the space from academia or industry.

Held on a weekly basis, the guild meetings provide guild members with continuous support for projects, technical and creative upskilling, and exploration of new opportunities to advance their craft. Perhaps most importantly, the guild meetings allow members to see each other as budding experts, forming professional networks that will last through their careers.

Guild Articles, Templates, Frameworks

Guilds can develop articles, templates, and frameworks to streamline project workflows, ensuring efficiency and quality in student work. These resources, created collaboratively by guild members, include:

- **Best Practices:** Documenting proven methods and techniques for various XR production roles, such as efficient 3D modeling workflows or effective project management strategies.
- **Work Arrangements:** Establishing clear guidelines for collaboration within teams, defining roles and responsibilities, communication protocols, and project timelines.
- **Expectations of Roles in a Project:** Outlining the specific tasks and deliverables expected from each role (e.g., project manager, 3D artist, narrative designer) to ensure clarity and accountability.

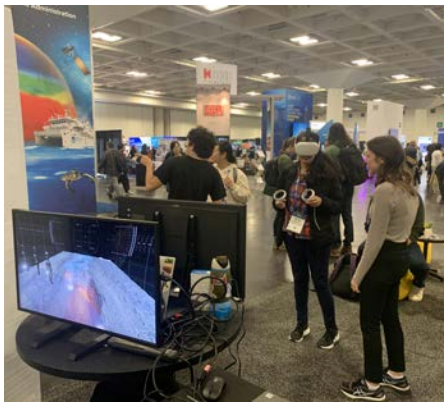
Publishing these resources benefits the Mesh community, the broader XR field, and ASU in becoming a thought leader in field building emerging disciplines.

- **Internal Knowledge Sharing:** New guild members can quickly onboard and understand established workflows, reducing the learning curve and fostering consistent project execution.
- **External Visibility:** Showcasing Mesh's expertise and contributions to the XR community, attracting potential partners, clients, and students interested in ASU's XR programs.
- **Industry Standards:** Contributing to the development of best practices and standards in the rapidly evolving XR field, positioning ASU as a thought leader.

This approach scales the impact of student work beyond individual projects, creating a lasting legacy of knowledge and resources that benefit the entire XR ecosystem.

Mesh Student Worker Journey

- **Explorer:** Engages in workshops and demo sessions, developing a curiosity about XR production.
- **Novice:** Joins the Mesh Guild system, learning how teams collaborate to create XR experiences. They enhance their knowledge and skills by taking relevant ASU courses.
- **Apprentice:** Seeks employment opportunities on a Mesh project to acquire practical experience under the guidance of project leaders and supported by Mesh Guilds.
- **Journeyman:** Assumes a leadership role within a Mesh team or subteam, actively contributing ideas and challenges for discussion within the Mesh Guilds.
- **Expert:** Pushes the boundaries of what is achievable with Mesh projects, mentoring guild members and guiding their upskilling journeys. They coordinate guild activities and engage in the design of templates and frameworks.
- **Alumnus:** Maintains a connection with ASU and Mesh, sharing industry experience with students and facilitating internships and full-time employment opportunities for ASU student workers.



Mesh Organizational Structure and Teaming

Mesh Founding Leadership Team Biographies

Dr. Robert LiKamWa is an associate professor in the School of Arts, Media and Engineering (AME) and the School of Electrical, Computer and Energy Engineering (ECEE). Since joining ASU in 2016, LiKamWa has directed Meteor Studio, a research lab and creative production studio that explores the research and design of software and hardware for mobile Augmented Reality, Virtual Reality, Mixed Reality, and visual computing systems, and their ability to help people tell their stories. To this end, Meteor Studio's research and design projects span three arcs: (i) advanced visual capture and processing systems, (ii) systems for hybrid virtual-physical immersion through augmentation of senses, and (iii) design frameworks for data-driven augmented reality and virtual reality storytelling and sensemaking.

Mesh is an evolution of Meteor Studio's creative production efforts, to be elevated as a HIDA program for scale across ASU. Meteor Studio will continue to conduct XR systems research, while Mesh constitutes a continuation of creative production efforts from Meteor Studio.

Meteor Studio's research is supported by a $4M research portfolio, comprising federal research grants from the NSF and DOD, as well as corporate projects and gifts from Google, Samsung, NVIDIA, Microsemi, Verizon, Komatsu, and Procter and Gamble. LiKamWa's research has also resulted in 5 patents. LiKamWa has won Best Paper and Best Demo Awards at ACM MobiSys, and Best Poster Awards at ACM HotMobile. He served as a program chair of ACM MobiSys 2024 and routinely serves on technical program committees for ACM SIGMOBILE conferences. LiKamWa earned his BS, MS, and Ph.D. in Electrical and Computer Engineering from Rice University. While a graduate student, he spent three summers interning at Microsoft Research and two semesters interning at Samsung Mobile Processor Innovation Lab. During his sabbatical, LiKamWa spent time at Dreamscape Immersive in Culver City, CA and NASA Jet Propulsion Laboratory in Pasadena, CA.

At ASU, LiKamWa has had an active role in the formation of Dreamscape Learn, connecting students to the Dreamscape Software Development Kit (SDK) to stimulate education in creative production using the Dreamscape pods. This has enabled Meteor Studio to support Dreamscape project work for WP Carey and SESE integrations, as well as course development of AME 494: Designing for Dreamscape, which LiKamWa taught alongside Dr. Ed Finn. LiKamWa was also the founding director of the Immersive Creation Studio at the Learning Futures Collaboratory (now Next Lab), where he pioneered the guild system with 120 student workers.

Skye Lucking is a Project Manager for Meteor Studio. For the past two years, Lucking has worked closely and collaboratively with leadership across the university and external clients to plan, organize, and execute projects related to XR experiences. Lucking has retooled the business operations of Meteor Studio to accommodate the dramatic increase in interest around XR's use in education, research, philanthropy, space exploration and beyond. Through her work, Lucking has streamlined processes to bring in client work as well as hire and upskill our student workforce to prepare for careers of the future.

Prior to working at Meteor Studio, Lucking was a working artist and muralist, and achieved certifications in spatial engine development (Unity) and full-stack web development to complement her degree in Management Information Systems from University of Oklahoma.

Stephanie Tomlin is a cross-disciplinary creative strategist with an 11-year background writing, designing and producing storytelling experiences for global entertainment brands like Sony Pictures, HBO, Riot Games and Disney. She brings her experience in interactive marketing campaign development and feature animation production to the MIX Center. As Industry Relations Director, her mission is to generate innovative partnerships that result in sponsored research projects, philanthropy, work-based learning and more boundary-pushing opportunities for students, faculty and community.

Prior to MIX Center, Tomlin was Director of Marketing at Phoenix-based Partnership for Economic Innovation, which propelled her passion for applying experiential interactive to the economic development world and inspiring Arizona talent to pursue creative technology careers.

Qianyu Ma is currently a program coordinator at Meteor Studio with a background in 3D design and UX/UI design, accumulating over eight years of experience in the field. Over the past 2 years, she has primarily focused on Dreamscape-related projects and successfully managed several immersive seated experiences. Her expertise in project management and design has significantly contributed to the creation of engaging multiple XR experiences, driving the studio's growth and success, fostering and maintaining relationships with various colleges at ASU.

Before joining Meteor Studio, Ma had extensive experience in experience design and UI design and achieved certifications in project management and spatial-engine development (Unity in VR, desktop development). These certifications enhanced her ability to communicate effectively in project management and professional practice and align different visions of the project. Ma has an MS in Human Computer Interaction from ASU, a Bachelor's of Fine Arts in 3D Design from University of Iowa, and a Bachelor's of Business Administration in Business Analytics from University of Iowa.

Team Structure

- Executive Director: Robert LiKamWa, strategic planning
- Director of Guilds: Skye Lucking, guild activity organization
- Director of Production: Stephanie Tomlin, project portfolio development and client intake
- Project Manager: Qianyu Ma, project execution oversight
- Project Manager: TBD

Subject to availability of funding, our teams will also incorporate full-time engineers/artists to serve as Mesh Guild experts and Mesh technical/creative support. Project Managers will be hired to support project work as it comes in, supported by project budgets. Over time, we will also seek to hire a Brand Manager to help navigate our branding and outreach both within ASU and externally. Business Operations for Mesh activities will be provided by HIDA. This will include hiring student workers, drafting project contracts, grant submission support, and coordinating with Skysong for IP negotiations.

ASU Advisory Board

- Sandra Stauffer, HIDA Associate Dean
- Erin Walker, ASU Foundation
- Elaine Armfield, Corporate Strategy, ASU Knowledge Enterprise
- Lisa Flesher, Chief of Realm 4
- John Vanden Brooks, Associate Dean of Immersive Learning
- Gemma Garcia, Executive Director, Learning Technology, Academic Enterprise

Mesh Partnership Development

Through the Mesh system, HIDA will channel partnerships with technology companies that empower creative production. For the partners, this connects the industry with potential sources of talent, technology, ideas, and visibility. For Mesh, HIDA, and ASU, this can lead to funding opportunities, job placement of our students, continual relevance to industry trends, and early access to technology.

HIDA Degree Program Integration

The student-oriented nature of the project work at Mesh propels ASU student workers through creative/technical upskilling, collaborative professional work experience, and portfolio development. Furthermore, the student-driven project work at Mesh creates highly visible examples of successful learner growth in creative production. This inspires students both inside and outside of Mesh to consider the opportunity of enrolling in advanced degrees in XR technologies, especially the two graduate degree programs that leverage the ASU Media and Immersive Experience Center (MIX Center):

- MS in Media, Arts and Sciences (Extended Reality (XR) Technologies)
- MSD in Design (Experience Design)

Student work opportunities within Mesh will defray the cost of these graduate degrees, creating accessible pathways to this advanced education, and ensuring the vitality of the MIX Center. Mesh Guilds also serve as a support network towards creative and technical depth. Work in Mesh can also satisfy Practicum and Applied Project requirements for the degree programs, creating efficient pathways for integrating work-based learning experiences with academic progress.

MIX Center hosts a strong array of facilities, technologies, personnel, and community around immersive media. Mesh provides accessible opportunities for students to productively activate the spaces of the MIX Center to support their collaborative project work. Moreover, the community-driven mission of MIX allows ASU to connect and inspire the local community with student-driven immersive media.

Key Performance Indicators and Metrics

The success of ASU Mesh will be evaluated based on a set of key performance indicators (KPIs) and metrics. These metrics will measure the impact of Mesh on students, faculty, and the university.

Student KPIs and Metrics

Tracked via quarterly surveys and a Mesh exit survey

- Number of students participating in Mesh programs and activities
- Number of students completing Mesh projects
- Student satisfaction with Mesh programs and activities
- Student job or internship placement within 6 months of graduation

Project KPIs and Metrics

Tracked via survey Mesh exit survey

- Number of projects using Mesh services to support research, teaching, and training
- Faculty and client satisfaction with Mesh services
- Number of XR projects completed by faculty in collaboration with Mesh
- External funding secured by faculty for XR projects

University KPIs and Metrics

- University-wide recognition of Mesh as a leader in XR education and production
- Increased visibility and reputation of ASU as an XR powerhouse
- Number of XR companies and organizations partnering with ASU
- Economic impact of Mesh on the local community

Additional Metrics

- Number of XR projects completed by Mesh
- Client satisfaction with Mesh project completion
- Number of students employed by Mesh
- Number of members in each Mesh Guild
- Number of workshops and training sessions offered by Mesh Guilds
- Number of articles published by Mesh Guilds

These KPIs and metrics will be tracked on a regular basis to assess the progress and impact of the Mesh system. The data collected will be used to inform decision-making and to improve the program.


MIX Center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