Rethinking Multimedia Design for Learning: Introduction to the Special Issue

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This is an introduction for the Journal of Applied Instructional Design (Volume 11, Issue 4) Special Issue on "Rethinking Multimedia Design for Learning".

What Motivated this Special Issue?

As the media landscape continues to expand in our lives, learning experience designers (LXDs) and instructional designers (IDs) find themselves needing to understand media design in different modalities to consider how those media can support learning. As "media" grows to encompass video presentations, information visualization, gaming, simulation environments, and extended reality, multimedia continues to be a frequent research topic and multimedia design is a core professional competency for LXDs and IDs (Molenda, 2022). As we consider the role that media can play in learning experiences, we see that multimedia is playing a more essential role in learning experiences.

Much of the research on multimedia design for learning has been grounded in work such as Mayer (2002), which provides theoretical models about the cognitive processing of multimedia information and practical guidelines for using multimedia in learning contexts. However, as media continue to evolve, the research on using multimedia to support learning must keep pace with these different media modalities so that we can strengthen the knowledge base about multimedia and learning, develop stronger theoretical foundations for understanding the impact of multimedia, and expand the body of practical strategies and guidelines that designers can use to integrate multimedia into learning experiences. For example, Ainsworth (2018) has noted that human learning is inherently multi-representational and that new representational forms are being invented as new educational technologies are advanced. Yet, most—if not all—well-established principles of multimedia learning are rooted in empirical research bounded by historical contexts that are different from the current learning landscape, as Hinderliter (2022) and Moore (2021) remarked.

As we continue to expand on the types of media modalities now at our disposal, the research and development activity for multimedia and learning aims to address the question of what counts as "good multimedia for learning." We need

continued inquiry by the learning sciences, human-computer interaction, and LXD/ID communities to re-examine long-held principles and approaches to support multimedia design for learning and adequately attend to the affordances and features of new kinds of technology-enhanced learning environments.

With that in mind, we (the Guest Editorial Team for this Special Issue) issued a call for scholars, practitioners, and educators to contribute to this special issue, to present their view on how instructional/learning designers, educators, and researchers should rethink multimedia design for learning in diverse technological contexts. We sought diverse views from applied research and practice perspectives through the following topics:

- The challenges and opportunities in adhering to well-established theories and guidelines of multimedia design for learning as they relate to new representational forms and technology-enhanced learning environments
- Proposed theoretical revisions or expansions to existing multimedia learning theory given the modalities and approaches supported by new technologies (e.g., haptic interactions, grounded and embodied learning, collaboration and remote learning platforms)
- Potential opportunities and limitations of emerging learning environments (e.g., augmented, mixed, and virtual reality) with respect to new types of affordances, features, and modalities to support educational research and instructional design
- Multimedia design failures and/or successes, and the lessons learned from bounded or situated design experiences
- Ethical, social, political, or economic considerations in the design of multimedia for learning in 21st-century learning environments

What Does this Special Issue Include?

Our goal for this Special Issue is to highlight the diverse thinking about multimedia design for learning in diverse contexts. We aspire to create an beneficial exchange of ideas among the communities of scholars, designers, and educators concerned with designing for learning, because such exchange will address the well-known gap between theory and practice. With that goal in mind, this Special Issue includes 12 papers in the following categories.

Instructional Design Practice Papers

The focus of these papers is on what instructional/learning design practitioners are doing in authentic contexts and their observed results in regard to multimedia design for learning. These papers cover topics of broad concern to instructional/learning design practitioners, representing issues of practical importance to working designers.

Stamper & Trosclair (2022) report on the steps they took to adopt the interactive-constructive-active-passive (ICAP) framework to transform faculty-led lectures into engaging and interactive lectures. They do so by presenting three case-studies where this approach has been implemented.

Herman et al. (2022) share a design case documenting the design of a virtual exhibit on the ethical use of learning analytics (LA) for the Museum of Instructional Design (MID), hosted in Mozilla Hubs. The authors/designers place a particular focus on the tension that the design team experienced as they negotiated established principles of multimedia design theory in their context of an emerging learning environment.

Bharwaney et al (2022) present and discuss perceived affordances, limitations, and future directions of Virtual Reality (VR) learning. They report on interviews they have conducted with 21 workplace learning leaders across diverse sectors and industries.

Instructional Design/Performance Design Position Paper

These position papers aim to bridge theory and practice through articulating conceptual frameworks and new ideas facing the instructional/learning design communities in relation to multimedia design for learning. The papers provide enough information to allow readers to understand current positions/ideas that the authors subscribe to or refute.

Richard E. Mayer (2022) responds to Hinderliter's (2021) chapter titled "The Case for Rethinking Multimedia" on the topic of Cognitive Theory of Multimedia Learning (CTML). Mayer offers an examination of what he considers to be some areas for improvement in instructional/learning design discpline's quest for evidence-based principles of multimedia design for learning.

Hinderliter (2022) addresses Mayer's Cognitive Theory of Multimedia Learning (CTML), and claims that CTML may work in opposition to the provision of accessible multimedia for learning. As an alternative, he offers a cognitivist framework, based on a return to Paivio's depiction of cognition, as an explanation for Mayer's observation of boundary conditions for the redundancy principle. This framework is called the "alt-cog" approach, used to recast multiple CTML theories as a set of principles for the design and development of learning through accessible multimedia.

Welch & Fleming (2022) advocate for story-based learning media that can activate universal motivators and improve learning retention. They argue that by creating stories that leverage universal motivators, learning designers can produce experiences that transcend simple knowledge transfer, and instead, effect behavioral change.

Moore et al. (2022) argue that the frameworks for multimedia lack a contextualized approach that recognizes dimensions of power and privilege or embedded meaning that either reifies or challenges societal structures within mediating artifacts. Shifting from an emphasis on media (i.e., things) to mediating, the authors argue that this shift allows us to differently frame the work instructional/learning designers do, and the artifacts they introduce into systems, emphasizing not merely the nature of the things but the impacts of them as well. Using case studies from fragile educational systems, the authors suggest the PRIME checklist as a series of reflective questions to critically analyze mediating artifacts being considered for inclusion in learning design.

Research Study on Applied Instructional Design

These papers are empirical studies exploring the application principles of multimedia design for learning in applied settings, using both quantitative and qualitative data.

Gok & Goldstone (2022) report on an ongoing design-based research project where they build and test alternative simulations that teach statistical concepts. Based on a grounded and embodied learning perspective, the core to their design position is that "difficult and abstract concepts and processes should be grounded in familiar objects that are intuitive to interpret, incorporate concrete animations that spontaneously activate learners' gestures, and be accompanied by verbal instruction for a deeply integrated learning."

Archibald et al. (2022) study how immersive 360° videos are relevant to journalism students' core (i.e., emotional) skill acquisition in a classroom on crisis and trauma coverage, using cardboard VR viewers. They analyzed 23 students' journal entries, supported by the Cognitive and Affective Model of Immersive Learning (CAMIL).

Li et al. (2022) report on an experimental study where they investigated how integrating nonverbal sound in embodied interaction impacted learning in a digital environment. A total of 140 undergraduate students participated in the experiment using an interactive learning activity, where nonverbal sound was used to guide learners' actions during the character writing activity.

Danish et al. (2022) propose and illustrate an approach to designing a learning environment, including activities and tools, using Cultural Historical Activity Theory (CHAT). They ground this work through their example of a mixed reality-based embodied simulation that they developed and evaluated for science education and a whole classroom context.

Veletsianos et al. (2022) report on an evaluation of an interactive narrative education intervention developed as part of a design-based research project into microlearning and COVID-19 misinformation. The intervention uses multimedia to enable learners to (1) name the role that fear and anger play in the spread of misinformation, and (2) identify a strategy for interrupting the spread of misinformation driven by fear or anger.

Concluding Thoughts

We hope that this Special Issue stimulates rich discussions on how LXDs and IDs, educators, and researchers can rethink multimedia design for learning in diverse educational and technological contexts. We are pleased to highlight diverse views and approaches on the topic and hope that the examples, frameworks, and practical strategies presented herein will guide and inspire learning professionals to implement these ideas in new and innovative ways. Even as a host of new technologies—such as AI-enabled authoring tools—loom on the horizon, we call on our colleagues to continue their multimedia research and design explorations. In this constantly evolving field, there will always be a need to learn more and discover how to most effectively design multimedia learning experiences.

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Dr. Ahmed Lachheb is a design scholar, a design practitioner, and a design educator. He serves as a Senior Learning Experience Designer at the University of Michigan's Center for Academic Innovation. His research interests include design practice, designers' design knowledge, and actions, design theory, and design pedagogy. Ahmed has earned his Ph.D. in Instructional Systems Technology from Indiana University Bloomington. He serves on the Editorial Board of the International Journal of Designs for Learning (IJDL). More about his work can be found on his website: www.lachheb.me

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Rebecca Quintana is Director of Blended and Online Learning Design at the Center for Academic Innovation and Adjunct Lecturer at the School of Education, at the University of Michigan. In these roles she applies her background in learning sciences and educational technologies to explore how design and technology can support learning. Her work focuses on integrating community-oriented approaches within the design of online learning environments. Her research encompasses novel representations to support design teams, analytic tools to characterize online pedagogies, and use of educational technologies to create rich opportunities for social interaction. Quintana earned her Ph.D. from the Ontario Institute for Studies in Education at the University of Toronto in the department of Curriculum, Teaching, and Learning.

Chris Quintana

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Chris Quintana engages in research that connects education and learning sciences, human-computer interaction, and computer science. He has focused much of his work on software-based scaffolding for middle school science students, including the development of scaffolded software tools, scaffolding frameworks for software, and learner-centered design processes. His recent work includes heading the Zydeco Project, which was funded by the National Science Foundation (NSF) to explore how mobile devices (e.g, smartphones and tablets) and web-based technologies can be integrated to connect science classrooms and museums to expand science learning opportunities. Using Zydeco, Quintana explored the possibilities and challenges of developing learning activities that integrate formal and informal learning environments. Other recent work includes exploring how new media, such as games, extended reality, wearable technology, and online educational approaches can be designed to support learning in a variety of contexts. Dr. Quintana's previous work involved working as a principal investigator in the Center for Highly Interactive Classrooms, Curricula, and Computing in Education (hi-ce), where he worked on several learning technology projects. Quintana led NSF-funded projects focused on developing and assessing software that supports students with different inquiry-based practices, such as the creation of software- based “digital idea-keepers” to support students in analyzing and synthesizing information found in digital libraries to answer science questions. He was on the research team for a project focusing on how media- rich digital texts that follow a “universal design for learning” approach may impact science learning. Other previous projects that Quintana has worked on include the ASSESS project to develop a “scaffolding design framework” to guide developers and researchers of learning technologies, and the Symphony2 project to develop a software framework that could be used to build scaffolded work environments. Aside from developing and researching different types of learner-centered software, Quintana is also interested in design processes and the notion of “design thinking” for education. His design activity informs his courses on the design and assessment of learning technologies, and other work exploring the development of new technology-enhanced learning spaces. Quintana received his BS from the University of Texas at El Paso in Biological Sciences, and his MS and PhD from the University of Michigan in Computer Science and Engineering.

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Jacob Fortman is an Emerging Technology Research Analyst at Grand Valley State University. In this role, Jacob works collaboratively with faculty, staff, and students to implement and research innovative technologies that foster critical and engaged learning experiences. Previously, Jacob was a Learning Experience Designer and Graduate Certificate Coordinator at the University of Michigan's Center for Academic Innovation. Jacob's scholarly interests center on situated, sociocultural, and critical perspectives in higher education and the learning sciences. He is particularly interested in how these concepts can inform our understanding of learning design practice. Jacob earned his MA in educational studies at the University of Michigan.