Leveraging Technology to Enhance Learner Engagement and Learning Outcomes: Innovations in Educational Practices and Environments Symposium

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Abstract: This symposium explores the multifaceted role of digital technologies in enhancing equitable and engaging learning experiences across diverse settings. Drawing on ten studies that span K–12 education, higher education, and informal learning environments, the session highlights how tools such as artificial intelligence, gamification, intelligent personal assistants, pedagogical agents, and ambient video environments are being used to support learners' cognitive, emotional, and motivational needs. Together, these papers address critical themes including digital inclusion, learner engagement, personalization, and the systemic conditions that shape effective technology integration. From the examination of digital divides and AI accessibility to the application of embedded assessments and performance expectancy frameworks, each study contributes unique insights into how technology can be strategically deployed to support learning for all. This symposium brings together researchers and practitioners to discuss evidence-based strategies, identify persistent challenges, and consider future directions for innovation in learning technologies.

Introduction

The integration of technology into education has become a pivotal factor in enhancing student engagement and learning outcomes. Recent studies have demonstrated that the thoughtful incorporation of digital tools can lead to significant improvements in student achievement and motivation. For instance, Schindler et al. (2017) found that technology facilitates higher-order thinking, collaborative problem-solving, and critical reflection, thereby enriching the educational experience. Similarly, the U.S. Department of Education (2017) emphasized that equitable access to high-speed internet and digital resources is essential for providing all learners with deep, complex, and active learning experiences.

However, the digital divide remains a significant challenge, disproportionately affecting students from marginalized communities. Moore et al. (2018) highlighted that disparities in access to technology hinder learning opportunities and perpetuate educational inequities. Addressing this divide is crucial for ensuring that all students can benefit from technological advancements in education.

The abstracts presented in this symposium collectively explore various facets of technology integration in education, including digital transformation, artificial intelligence, gamification, and personalized learning. They examine how these technological innovations can enhance student engagement, bridge educational gaps, and promote equitable learning opportunities. By synthesizing insights from recent research, this symposium aims to provide a comprehensive understanding of the current landscape of educational technology and its implications for future teaching and learning practices.

The Symposium

The research showcased in this symposium share a common theme of "Leveraging Technology to Enhance Learner Engagement and Learning Outcomes". It explores how technological innovations can address barriers to access, improve student engagement, and enhance learning outcomes across diverse contexts. It reflects the multifaceted applications of learning technologies, from digital transformation and AI-driven tools to gamification, nonverbal communication, and personalized learning strategies. The focus is on understanding and optimizing the use of these tools to foster inclusivity, motivation, and deeper learning experiences. Through this theme, we explore how learning technologies can:

- Enhance engagement through innovative methods like gamification, pedagogical agents, and interactive instructional videos.
- Bridge gaps in accessibility and equity, particularly in marginalized communities and underrepresented student groups.
- Improve adoption and effectiveness of digital tools like Learning Management Systems, intelligent personal assistants, and digital readers.
- Promote interdisciplinary and inclusive approaches to digital transformation and educational technology implementation.

The following papers are included in the symposium:

Corshonedia "Shonda" Hodge, Steven Guthrie	**Title**: Bridging or Widening? The Impact of Artificial Intelligence on the Digital Divide Among Black Americans: A Systematic Literature Review **Abstract:** The rapid rise of artificial intelligence (AI) technologies presents both opportunities and challenges for addressing the digital divide among marginalized communities. While AI holds the potential to increase innovation and efficiency, it risks reinforcing existing inequities, especially for Black Americans, who have long faced barriers in accessing and benefiting from digital technologies. This presentation shares the findings of a systematic literature review examining the "AI Divide"—inequalities in access to and utilization of AI—focusing on its implications for the digital divide among Black Americans. Guided by three research questions, this study identifies patterns and trends in the literature on AI accessibility, barriers to utilization, and the influence of educational and socioeconomic factors. By synthesizing insights from 14 peer-reviewed studies, the presentation highlights how AI might exacerbate the

	existing digital divide and outlines pathways for mitigating its negative impacts through equity-focused interventions. **Objectives:** 1. To define and contextualize the "AI Divide" as a facet of the digital divide among Black Americans. 2. To synthesize current research on barriers to AI access, utilization, and benefits for Black Americans. 3. To provide actionable recommendations for researchers, educators, policymakers, and technologists to bridge the AI Divide. **Significance:** This research is critical for understanding how emerging AI technologies intersect with systemic inequities, particularly as AI adoption accelerates across industries. By addressing a gap in the literature, this presentation equips stakeholders with the insights needed to foster equitable access to AI and ensure its benefits are shared across diverse populations. **Keywords:** Digital Divide, Artificial Intelligence, AI Divide, Black Americans, Equity in Technology, Systematic Literature Review
Jonathan Gamez, Oscar Villalobos	**Title**: Assessing Technology Confidence and Acceptance in Higher Education: An Analysis of the Computer Attitude Questionnaire (CAQ) and Technology Acceptance Model (TAM) **Abstract**: In today's digitally connected educational environments, understanding students' attitudes toward technology is essential for effective instructional design and support. This study explores two critical dimensions of technology perception in higher education: Technology Confidence and Acceptance, assessed through the Computer Attitude Questionnaire (CAQ) and the Technology Acceptance Model (TAM). Using a sample of 155 participants, we conducted an exploratory factor analysis to validate constructs within the CAQ and TAM, specifically focusing on Perceived Usefulness (PU), Perceived Ease of Use (PEU), and Technology Educational Support (TES). Preliminary analyses using independent t-tests revealed significant differences across age groups, and plan to extend the analysis to include other demographic factors and conduct a correlation analysis to assess alignment between CAQ and TAM scores. Thus, these findings are expected to inform age-based educational interventions and contribute to enhanced accessibility and effectiveness of digital resources in higher education.
Marcus Taylor	**Title**: Design & Research Proposal: The AI-Powered Personalized Learning Environment (AI-PLE) Boosting AI Literacy and Responsible Use in Higher Education **Abstract**: The rapid integration of Artificial Intelligence (AI) into higher education presents significant challenges, primarily faculty and student underpreparedness in AI literacy and responsible application. This deficiency leads to implementation difficulties, misuse of tools, ethical concerns, and resistance. This Design & Research (D&R) proposal outlines the development and initial testing of the AI-Powered Personalized Learning Environment (AI-PLE), a technology-enhanced ecosystem designed to address this gap. Grounded in constructivist principles, the How People Learn (HPL) framework, Open Learning Environment (OLE) characteristics, and the 4C/ID model, the AI-PLE aims to develop critical AI literacy, foster responsible adoption, and promote ethical practices among faculty and students. The D&R methodology involved problem analysis, literature review, solution design, prototype construction (an introductory faculty module), and simulated pilot

	testing (N=40 faculty). Assessment included pre-/post-quizzes, artifact analysis via rubric, and usability/affective surveys. Simulated pilot results indicated significant gains in foundational knowledge and confidence, and reduced anxiety. However, findings also highlighted the need for enhanced scaffolding for applying ethical principles to practice and improved integration of procedural support. This proposal details the problem, literature-informed design, prototype, testing instruments, simulated findings, and reflections, concluding with recommendations for iterative refinement of the AI-PLE. **Keywords:** Artificial Intelligence, AI Literacy, Higher Education, Personalized Learning, Learning Environment Design, Design-Based Research, Educational Technology, Ethics in AI, Faculty Development
Julie J. Hester	**Title**: Exploring Student Perceptions of Blended Learning in Higher Education **Abstract**: This discussion reviews recent research on student perceptions of blended learning and presents a proposed pilot study designed to examine these perceptions in a post-pandemic context. While much of the existing research was conducted before or during the COVID-19 pandemic, limited studies have addressed how students currently experience and evaluate blended instruction. This proposed pilot study will survey two-year community college students enrolled in blended courses to explore their views on flexibility, workload management, and technology use. It also seeks to understand whether these perceptions vary by demographic factors such as age, employment, and veteran status. By focusing on a diverse student population often underrepresented in blended learning research, this study aims to identify areas for future research and guide the development of more inclusive, effective learning environments.
Julie Cummings	**Title**: Pre-service Teacher Education and Implementation of TPACK Framework in Educational Technology Courses **Abstract**: This paper examines pre-service teacher technology education and proposes strategies to better prepare incoming teachers for integrating technology in K-12 classrooms. It emphasizes the importance of intersecting technology, pedagogy, and content knowledge (TPACK) to develop critical thinking skills beyond specific tools. The research reviews educational technology frameworks, highlighting TPACK's relevance in teacher preparation. It discusses barriers to technology implementation in teacher education programs and suggests embedding technology throughout the curriculum rather than teaching it in isolation. The paper advocates for computational thinking integration to enhance problem-solving skills and technology adaptation. It concludes that pre-service teacher education should focus on critical analysis of technological tools within the TPACK framework, preparing educators to implement both current and future technologies effectively in K-12 settings. **Keywords:** pre-service teacher education, TPACK, educational technology, computational thinking, technology integration
E. Shay Carter	**Title**: Gamification and Persistence in Complex STEM Learning: Integrating Technology to Drive Persistence, Engagement and Resilience in High Cognitive Load Tasks. **Abstract**: Nearly half of students majoring in the hard sciences switch to other fields within two years of matriculation (Chang et al., 2008). This graduation gap is even more pronounced among underrepresented students, with only 24% of those who initially declared a science major ultimately earning a degree in

	the field (Center for Institutional Data Exchange and Analysis, 2000). Research indicates that student performance in introductory science courses plays a critical role in shaping their decision to persist in these majors (Seymour & Hewitt, 1997). This presentation investigates the potential of gamified learning platforms to bolster persistence in tackling complex STEM challenges, framed within well-established educational technology theories such as the Technology Acceptance Model (TAM) and key engagement frameworks. By strategically integrating game-based elements—such as competition, rewards, and interactive scenarios—these platforms offer innovative approaches to surmounting persistent barriers in disciplines like chemistry, physics, and mathematics. Through fostering sustained engagement and resilience, gamification can support students in navigating high-cognitive-load tasks, encouraging a deeper investment in their learning journey and ultimately influencing retention and success in STEM pathways.
Shadarra James	**Title**: Intelligent Personal Assistants/ Smart Speakers As a Learning Tools in K-12 Education **Abstract**: Amazon Alexa and similar devices are known as intelligent personal assistants. These devices have become commonplace in homes, businesses, and educational institutions worldwide. While there is much research about the science behind the large language model used by this technology tool, more research is needed to explore the ways it can be used in education and the learning outcomes from its use. We conducted a literature review to explore how intelligent personal assistants have been used in educational settings and the impact of using these devices. Smart speakers like Amazon Alexa can be used as learning tools to individualize instruction for learners and positively impact language acquisition for second language learners. **Keywords:** Intelligent personal assistant, AI, Alexa, smart speakers, K-12 education
Cassandra E. Buffington-Bates	**Title:** Nonverbal Communication: The Impact on Emotion Design of Pedagogical Agents and Learning Outcomes **Abstract:** The literature review titled Nonverbal Communication: The Impact on Emotion Design of Pedagogical Agents and Learning Outcomes examines nonverbal communication's role in enhancing pedagogical agents' effectiveness in educational settings. As technology integrates deeper into learning environments, virtual agents—embodied, human-like characters—facilitate emotional engagement and learning through nonverbal cues. This review explores how nonverbal behaviors such as facial expressions, gestures, and appearance influence students' motivation, emotional involvement, and learning outcomes. The study is grounded in theoretical frameworks like cognitive load theory, persuasive technology, and socio-agency theories, providing a basis for understanding the role of nonverbal cues in promoting cognitive and affective outcomes. The review addresses three central questions: the impact of nonverbal cues on learner engagement, identifying the most effective nonverbal behaviors for pedagogical agents, and understanding how emotional design influences educational outcomes. Findings highlight that well-designed nonverbal communication in pedagogical agents enhances retention, reduces cognitive load, and improves emotional response, although overly enthusiastic agents may occasionally disrupt learning. Challenges remain in designing agents that balance realism with educational goals. The review concludes by recommending further investigation into the nuanced effects of emotional

	design across diverse learning environments, mainly through longitudinal studies examining both positive and negative emotional impacts. By understanding and strategically applying nonverbal communication principles, designers can optimize educational technologies to foster meaningful and emotionally supportive learning experiences. **Keywords:** Nonverbal Communication, Pedagogical Agents, Emotional Design, Learning Outcomes, Cognitive Load, Motivation, Engagement
Gloria James-Avalos	**Title**: Decreasing Anxiety with Nature Through Technology **Abstract**: Studies have found that individuals spend nearly only ten percent of their time outdoors, near green spaces, despite the mental and physical health benefits these spaces have to offer (Snell et al., 2019). Based on the vast amount of evidence, this paper argues that green environments of nature displayed as Ambient Video Backgrounds (AVB) accompanied by sound/music can reduce stress and anxiety (Mostajeran et al., 2021; O'Meara et al., 2020 & Snell et al., 2019). Green environments are landscapes such as forests, nature parks, gardens and other such surroundings that are encompassed by green nature. Green spaces are also regarded as "forest bathing" and "forest therapy" (O'Meara et al., 2020). The Normalization Process Theory (NPT) is a practical and appealing theory to apply to the introduction of Ambient Video Backgrounds (AVB). NPT proposes theory of specific characterizations of how well a new concept, be it abstract or tangible, will be accepted by the general population (May et al., 2018). Because of the ease and potential of AVB, it is highly probable that they will be inherited as everyday spaces in schools, offices and even homes.
Steven Guthrie	**Title:** Boundary Spanning and Knowledge Building: A Systematic Literature Review for Enabling Successful Digital Transformation **Abstract:** Digital transformation is a critical pathway for organizations seeking to remain competitive in an era of rapid technological innovation. However, its success depends not only on the adoption of digital tools but also on the cultivation of robust knowledge-building practices that span organizational, disciplinary, and geographic boundaries. This systematic literature review investigates the role of boundary spanning—a process of bridging divides across knowledge, expertise, and organizational silos—in facilitating effective digital transformation. By synthesizing research from fields including organizational studies, information systems, and knowledge management, this study identifies key mechanisms, strategies, and outcomes of boundary-spanning activities that impact the learning technology and social networking solutions that global organizations should and do implement to remain competitive in the highly digitized world of today. The presentation will highlight best practices, critical success factors, and gaps in the existing literature, offering educators, researchers, and practitioners actionable insights into fostering collaborative knowledge ecosystems. Attendees will gain a deeper understanding of how boundary-spanning roles, technologies, and frameworks can be leveraged to build shared understanding and drive transformative change in digital contexts. **Objectives:** 1. To explore the theoretical foundations and practical applications of boundary spanning in digital transformation. 2. To identify the key mechanisms through which boundary spanning contributes to knowledge-building.

	3. To offer evidence-based strategies for practitioners and researchers to enhance collaboration and innovation in digitally transforming environments. **Significance:** As organizations worldwide grapple with the challenges of digital transformation, this review provides a timely and comprehensive synthesis of the role boundary spanning plays in navigating these complexities. This research bridges gaps in understanding, equipping stakeholders with strategies to address barriers, align diverse perspectives, and enhance knowledge integration. **Keywords:** Boundary Spanning, Digital Transformation, Knowledge Building, Learning Technologies, Social Networks, Systematic Literature Review, Organizational Innovation, Global Competencies, Collaborative Practices

Within the overarching theme of "Leveraging Technology to Enhance Student Engagement and Learning Outcomes", the symposium encompasses four cohesive themes based on shared focus areas. The themes are structures as follows:

Theme	Papers
Bridging Equity and Accessibility in Technology Papers in this category focus on addressing barriers to technology adoption and promoting equity in access and utilization, with emphasis on underrepresented groups, higher education, and tools like LMS.	Bridging or Widening? The Impact of Artificial Intelligence on the Digital Divide Among Black Americans: A Systematic Literature Review
	Assessing Technology Confidence and Acceptance in Higher Education: An Analysis of the Computer Attitude Questionnaire (CAQ) and Technology Acceptance Model (TAM)
	Exploring the Role of Performance Expectancy in LMS Adoption and Student Comprehension in Higher Education: A Study Guided by the Unified Theory of Acceptance and Use of Technology (UTAUT)
Enhancing Engagement Through Digital Tools Papers in this category explore innovative strategies to engage learners actively, using tools like interactive videos, gamification, and e-readers to foster motivation and improve learning outcomes.	Exploring Student Perceptions of Blended Learning in Higher Education
	Pre-service Teacher Education and Implementation of TPACK Framework in Educational Technology Courses
	Gamification and Persistence in Complex STEM Learning: Integrating Technology to Drive Persistence, Engagement and Resilience in High Cognitive Load Tasks.
Innovative Technologies for Personalized Learning Papers in this category highlight the use of emerging technologies, including AI-driven tools and immersive environments, to individualize learning experiences and address learners' cognitive and emotional needs.	Intelligent Personal Assistants/ Smart Speakers as a Learning Tools in K-12 Education
	Nonverbal Communication: The Impact on Emotion Design of Pedagogical Agents and Learning Outcomes
	Decreasing Anxiety with Nature Through Technology
Digital Transformation and Knowledge Building The paper in this category reflects on organizational and interdisciplinary approaches to leveraging technology for transformation and innovation, creating a broader and more	Boundary Spanning and Knowledge Building: A Systematic Literature Review for Enabling Successful Digital Transformation

inclusive context for the symposium.	

Conclusions

As digital technologies continue to evolve and influence every aspect of personal, professional, and educational life, it is critical to examine how they can be harnessed to support equitable, engaging, and impactful learning experiences. This symposium has brought together diverse perspectives and empirical findings that demonstrate how technologies—from artificial intelligence and gamification to ambient environments and pedagogical agents—can enhance motivation, personalize instruction, and support cognitive and emotional learning outcomes across multiple contexts. The contributions collectively emphasize the importance of inclusive design, strategic implementation, and evidence-based evaluation in shaping technology's role in learning.

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