

# How Multimedia Learning Environments Enhance Understanding, Engagement, and Self-Regulated Learning

Dr. Ayomi Indika Irugalandara, Mr. M.D.B. Prasad Weerasinghe

*Department of Secondary and Tertiary Education, Faculty of Education, The Open University of Sri Lanka*

Received: May 03, 2025

Accepted: May 21, 2025

Published: May 26, 2025

## Abstract

The rise of digital transformation in education has introduced multimedia learning environments that integrate interactive technologies such as SMART Boards and digital platforms. Sri Lanka also using the innovative systems like student information platforms, learning management tools, however, it is still new to the application of creative arts like Drama and Theatre in the higher education institutions. Application through a personalized learning approach, the research explores how SMART Boards foster deeper understanding, increased engagement, and enhanced self-regulated learning among students with a focus on their application in Drama and Theatre education degree program in the Open and Distance Learning environment. The study reported upon in this paper was based on a Bachelor of Education Honours in Drama and Theatre degree program Level 5 students on their Activity Based Assignment Day-school evaluation process. The paper focuses on the following research question on “how multimedia learning environments enhance understanding, engagement, and self-regulated learning in teaching drama and theatre through personalized, interactive learning methods? Data were collected from 34 students-teachers from their feedback forms and classroom observations. Findings reveal that multimedia tools bridge theoretical concepts with practical applications, promote active learning, and empower learners to take ownership of their educational journeys. Challenges, such as digital literacy gaps and limited access to devices, are also discussed with recommendations for equitable implementation.

**Keywords:** Digital transformation; multimedia learning environments; interactive technologies; SMART Boards; personalized learning; self-regulated learning; higher education; Sri Lanka.

## INTRODUCTION

Educators today face the pressing challenge of student disengagement, a factor that can significantly impact learning outcomes and student satisfaction (Fredricks, Blumenfeld, & Paris, 2004). To address this issue, teachers are advocating for enhanced professional development with a focus on technology integration. Research shows that incorporating technology in classrooms can revolutionize pedagogy by offering interactive tools that boost student engagement, making learning more dynamic and personalized (Schleicher, 2018). This technology-driven approach not only enhances students' motivation, engagement, and teaching practices but also prepares them for success in an increasingly digital world (Klopov et al., 2023). Such technologies include computers, mobile devices, software applications, online resources, and digital platforms that are reshaping educational practices globally.

As educational institutions worldwide adopt digital transformation, SMART board technology has emerged as a promising solution to respond to learners' diverse needs. SMART boards provide dynamic, interactive capabilities that support multiple learning styles, encourage collaborative engagement, and make learning experiences more tangible and relevant (Beauchamp & Kennewell, 2010).

Academics are also aware of the potential of innovative systems such as student information platforms, learning management tools, attendance trackers, and real-time performance analysers. However, a critical question remains: how can educational institutions integrate these advanced technologies smoothly within pre-service teacher training? Research highlights that successful integration of technology requires tailored approaches, particularly in contexts like

Open and Distance Learning (ODL) where adult learners may face unique challenges in maintaining motivation and engagement (Anderson, 2008).

While many Western countries rapidly adopt digital tools to revolutionize teaching and learning, they also grapple with a host of new challenges (Means et al., 2010). In developing countries, where digital transformation resources may be limited, institutions like the Faculty of Education encounter particular difficulties in the ODL environment, especially for adult learners. This article investigates the path toward digital transformation in the Bachelor of Education Honours degree program, proposing a concise yet robust framework for modernizing digital infrastructure.

To address this gap, this study explores the role of personalized learning strategies, facilitated by SMART board technology, in enhancing Understanding, Engagement, and Self-Regulated Learning among pre-service drama students at the Open University of Sri Lanka (OUSL). Additionally, it investigates how creating personalized learning journeys can empower student-teachers to co-create learning plans, promoting ownership and active involvement in their progress. If successful, personalized learning can effectively support lower-attaining students while providing stretch opportunities for higher achievers, thereby enriching teaching practices by fostering adaptable strategies aligned with individual goals (Wang et al., 2014). This research contributes to a growing body of literature on technology use in ODL settings, specifically within Drama and Theatre education, by offering insights into how these tools can support meaningful, interactive learning and skill development aligned with real-world applications.

## **LITERATURE REVIEW**

### **Personalized Learning and Interactive Technology in Education**

Personalized learning tailors instructional approaches to meet the unique needs, preferences, and strengths of individual learners, fostering a sense of belonging and ownership within the learning environment (Hopkins, 2010). Numerous studies highlight the advantages of this approach in promoting student motivation and achievement by aligning educational content with personal goals and interests (Fredricks, Blumenfeld, & Paris, 2004). In recent years, personalized learning has become increasingly feasible through digital platforms that support individualized pacing, real-time feedback, and learner autonomy (Wang et al., 2014). With advancements in technology, educational environments now offer diverse pathways for learners, supporting an inclusive model that values both excellence and equity (Hopkins, 2010).

Interactive technologies, including SMART boards, play a crucial role in this shift toward personalized learning, transforming classrooms into active, student-centered spaces. Studies on interactive boards underscore their impact on engagement, as they allow students to manipulate and interact with content visually and collaboratively, fostering a deeper cognitive connection to the material (Beauchamp & Kennewell, 2010). SMART boards, specifically, facilitate participatory learning environments where students engage in real-time discussions, receive immediate feedback, and collaborate on shared tasks, enhancing both engagement and comprehension (Klopov et al., 2023). By adapting instructional content to each student's pace and interests, SMART boards support an immersive learning experience that is particularly effective in creative fields, where dynamic, hands-on engagement is vital.

### **Interactive Technology in Creative and Performing Arts Education**

The role of digital tools in creative and performing arts education, while less explored than in traditional academic subjects, has shown promising outcomes. Drama and Theatre education, in particular, benefit from interactive technologies that enhance collaborative and experiential learning, aligning well with the creative nature of these disciplines. Research suggests that tools such as SMART boards and other interactive devices foster skill development in creative arts by enabling students to visualize and experiment with concepts that are typically abstract (Olugbade, Dare, & Tolorunleke, 2023; Gunawardena & McIsaac, 2004). For example, SMART boards allow drama students to simulate stage settings, map out scenes, or animate character interactions, thereby bridging theory and practice in tangible ways.

In Drama and Theatre education, Vygotsky's socio-cultural theory emphasizes the importance of social interaction and shared experiences in cognitive development (Garaigordobil, 2006). The collaborative and interactive nature of digital tools aligns with this framework, as these tools enable students to participate in group problem-solving, exploration, and co-creation. Vygotsky's theory supports the use of digital tools as mediators in the learning process, helping learners construct meaning through social interactions. SMART boards, for example, can support collaborative drama projects

by enabling students to work together on character analysis, scene visualization, and thematic exploration, thereby deepening their understanding through active participation.

Studies specific to the performing arts also indicate that digital tools can stimulate creativity and enhance engagement by supporting activities that involve critical thinking and problem-solving. For instance, in creative fields where self-expression and experimentation are key, interactive technologies provide a platform for students to visualize concepts, create digital storyboards, or design sets in real-time (Plooy, Casteleijn & Franzsen, 2024). Such tools allow students to apply theoretical knowledge to practical tasks, thus bridging the gap between abstract ideas and concrete applications. Furthermore, SMART boards in performing arts have been found to foster an environment where students feel empowered to take risks and explore innovative ideas, enhancing their engagement and agency (Fitzgerald & Evans, 2024).

### **Enhancing Understanding through Interactive Technology**

Interactive Technology learning environments significantly improve learners' comprehension by presenting information in dynamic, interactive, and visually appealing ways. Tools like SMART Boards and interactive digital applications make learning more engaging and effective by enabling learners to visualize complex concepts and connect them to real-world scenarios. Researchers like Mayer (2009) Clark and Lyons (2010) stated that interactive tools allow students to simulate real-world applications, such as creating stage settings, visualizing character relationships, or mapping out narratives. These activities deepen understanding by providing tangible representations of abstract concepts. Hattie and Timperley (2007) identified that multimedia environments offer immediate feedback, helping learners identify errors and reinforce learning through repetition. Moreover, Alisauskiene et al., (2020) and Bond and Bedenlier (2019) mentioned that multimedia tools enable tailored instruction, adapting content to learners' needs, paces, and interests. This ensures that students grasp concepts thoroughly before moving forward. For example, in Drama and Theatre education, SMART Boards allow students to create interactive storyboards, analyze character motivations, and visualize stage designs, which enhances their comprehension of drama theory and its practical applications (Beauchamp & Kennewell, 2010). Research also highlights that multimedia learning improves cognitive load management by combining text, visuals, and interactivity, facilitating better retention and understanding (Mayer, 2021). Studies show that tools like video-based simulations and 3D modeling allow students to explore complex concepts interactively, fostering a deeper grasp of subject matter. For instance, in science education, multimedia tools have been found to improve understanding of abstract ideas like cellular processes and chemical reactions (Lee & Tsai, 2013). Similarly, in creative disciplines, multimedia simulations and visual mapping engage learners more effectively by allowing them to experiment with and internalize abstract ideas (Fitzgerald & Evans, 2024).

### **Fostering Engagement through Interactivity and Collaboration**

One of the primary challenges in education is maintaining student engagement. Multimedia learning environments address this challenge by making learning interactive, collaborative, and personally meaningful. Tools like SMART Boards facilitate group activities where students collaborate on tasks such as designing set plans or creating digital storyboards. This promotes teamwork, communication, and active participation (Bond & Bedenlier, 2019). Multimedia tools connect theoretical concepts to practical tasks, making learning more meaningful. For instance, Drama students can design stage layouts and experiment with visual storytelling in real time. Multimedia environments allow students to make choices regarding their learning paths, fostering intrinsic motivation and ownership of learning. Research highlights that interactive technologies increase student enthusiasm and participation, particularly for adult learners who require dynamic approaches to sustain engagement (Katz & Assor, 2007). In creative disciplines, this approach encourages experimentation, risk-taking, and innovative thinking.

### **Promoting Self-Regulated Learning**

Self-regulated learning empowers students to manage their own educational progress by setting goals, monitoring outcomes, and reflecting on their learning processes. Instructional applications of digital technology have proven particularly effective in promoting Self-Regulated Learning (Barak, 2010; Delfino et al., 2008; Denton et al. 2008; and Geddes, 2009).

According to Wang, "the main advantage of e- Learning is that it overcomes the limits of time and space and provides learners opportunities to perform self-directed learning" (Wang et al., 2005, p.17). This is fortunate since, as a result

of increased autonomy, “online learners must take greater responsibility for the management and control of their own academic progress”. (Artino, 2007). Self-regulated learning is associated with a range of individual student differences, including level of self-efficacy, motivation and emotional control (Efklides, 2011).

Such student characteristics may be more easily accommodated in digital, as opposed to traditional, learning environments. The student who is self-regulated continuously monitors and evaluates his/her understanding of the task, the appropriateness of his/her personal learning goals, the effectiveness of his/her plan and the success of the strategies implemented.

## **Research Context and Background Information**

The Bachelor of Education Honours in Drama and Theatre Degree Programme at the Open University of Sri Lanka (OUSL) offers a unique educational pathway for aspiring drama teachers. Since its inception in 2012, the program, developed in collaboration with the Drama and Theatre School of the Tower Hall Theatre Foundation (THTF), has integrated both theoretical and practical components in drama and theatre education. The program spans four years, with students dedicating the first two years (levels 3 and 4) to studying drama theory and practical applications at the THTF. In their third and fourth years (levels 5 and 6), students join the Department of Secondary and Tertiary Education to undertake educational courses, thereby equipping them with essential competencies for teaching.

The main aim of this degree programme is to develop the range of competencies needed for graduates to serve as effective Drama and Theatre teachers. During this two years they received face to face interactive sessions (traditionally called “day-schools”) within the university, professional workshops, practical teaching sessions, presentations, guest lectures, and field visits. These methodologies aim to provide a comprehensive, immersive learning experience, ensuring that graduates are well-prepared to lead drama education in various settings. While traditional methods such as printed study materials are still utilized, the program has gradually integrated digital components through the Learning Management System (LMS) to accommodate evolving educational needs, including supplementary resources that provide real-time updates and content distribution. No Zoom sessions at all after the COVID 19 Pandemic for this programme.

As part of the programme student-teachers undertake a six month teaching practice in a government school, teaching the Drama & Theatre subject at any secondary-level grade. During these six months they complete a minimum of 120 planned teaching sessions. Evaluation of five of the lessons is conducted by a Master Teacher or a university academic. After successful completion of all requirements of their Stage I Teaching Practice, the student-teachers are eligible to undertake the Stage II component. This is the evaluation stage for the final examination. Traditionally, Teaching Practice Stage II involves the evaluation of two lessons and is conducted by a visiting university lecturer in the selected school.

As a part of the assessment there are three different assignments incorporate in the programme. The amount of assignments depends on the course credit. The assignments called, Take Home Assignment (THA), Continuous Assignment Test (CAT), and Activity Based Assignment Day-school (ABAD). However, despite these efforts, challenges remain, particularly concerning engagement in the ODL setting. A significant challenge identified in this context is sustaining student engagement and motivation, especially among adult learners who may require more personalized support and flexibility to remain motivated. The integration of SMART boards as part of this study seeks to address this challenge, allowing for a more interactive and adaptable learning environment that aligns with the diverse needs of adult learners in ODL.

## **METHODOLOGY**

### **Research Questions**

This study is framed around the primary research question: How can the use of SMART boards enhance student engagement in teaching drama and theatre through personalized, interactive learning methods? Additionally, a secondary question guides the exploration of personalized learning outcomes: How can SMART boards support a personalized learning approach that fosters creativity and autonomy in drama education?

### **Sample and Data Collection**

The sample consists of 34 Level 5 pre-service student-teachers enrolled in the Bachelor of Education Honours in Drama and Theatre Degree Programme for the 2023/24 academic year. This research paper was based on the course

STU5817—Educational Technology for Teaching Drama and Theatre, an 8-credit course that includes both theory and practical components, with an estimated total workload of 400 hours. This course particularly related to the Teaching practice to prepare them an effective teaching strategies and evaluation strategies in the drama classroom.

Data was collected through feedback forms and observations. Feedback forms focused on identified students' experiences and challenges during the ABAD process and how SMART board's impact on their learning, and the extent to which personalized learning needs were met. Observations captured the students' interactions with the SMART board during instructional activities, noting how the tool facilitated collaboration, engagement, and personalized learning experiences.

### **Procedure**

Building on the researcher's experience with creative teaching methods, this study aimed to enhance student engagement through an activity-based learning environment. A five-hour ABAD session was implemented in a computer lab equipped with SMART board technology to create an interactive and immersive experience. In the first 30 minutes the introduction and the structure of this activity explained. Afterwards, a personalized learning approach was adopted as an academic support strategy, allowing each student to progress according to their unique learning needs, interests, and aspirations.

Application of the personalised learning approach, following characteristics are guided. According to the interests of the student-teachers, they selected their own lesson and the content, teaching style and goals of the lesson plans were geared toward the individual needs of each learner. As this is a highly collaborative approach, the session began by organizing students into small groups of 4-5, as students with similar learning styles or interests often work together in groups; which helps them to build great social, leadership and communication skills. Each group was tasked with selecting a drama topic and designing a 40-minute lesson plan and activity suitable for a secondary school classroom and students have a choice of how to learn and what to learn. The pace of instruction was adjusted according to individual student or group. The SMART board used as personalised learning technology to accomplish the objectives of personalised learning.

Student-teachers crafted and presented their lessons, with a focus on enhancing creativity and engagement. This setup allowed students to explore digital tools and actively participate in a dynamic, hands-on learning process. The researcher collaborated with a probationary lecturer to facilitate the session and ensure tailored guidance for each participant.

### **Analysis**

A qualitative content analysis was employed to examine the data. This method combines describable procedures with elements that rely on the researcher's insight or intuitive actions, which can be challenging to articulate (Elo & Kyngäs, 2008). To ensure validity, the researcher followed three phases: first, gathering relevant data to understand observed behaviors; second, developing a matrix to review data for content and alignment with identified categories (Polit & Beck, 2012); and third, describing the results based on the content of categories related to the phenomenon, using a structured approach.

## **RESULTS**

The main themes identified in the content analysis include engagement, collaboration, motivation, student autonomy, and creativity. Observations in the classroom showed that integrating SMART board technology significantly boosted student engagement and collaboration, consistent with research on interactive technologies in education. Many students reported feeling more motivated and connected to the coursework, as reflected in comments such as, "I'm excited to use design in group projects" and "I feel like I'm doing something real." Such comments and interactions indicate that SMART boards, by making content visually engaging and interactive, encourage students to focus on quality-driven learning rather than merely completing tasks. This shift promotes peer feedback and collaborative improvement (Alexander et al., 2019).

SMART Boards have been shown to enhance student agency and autonomy, particularly in creative, self-directed fields like drama. Many students initially felt uncertain and hesitant to admit their limited familiarity with this technology. However, by adopting a personalized approach and fostering a supportive environment that did not assume prior



expertise, student-teachers effectively helped bridge this gap. Engaging students in hands-on, group-based activities allowed them to connect theoretical concepts with practical applications, resulting in a more immersive and authentic learning experience. Research by Alisauskiene et al. (2020) supports this approach, noting that when students have control over their learning through technology, they are more likely to engage meaningfully and invest in their education. Additional studies emphasize the importance of instructional support that caters to diverse learning preferences by offering both visual and kinaesthetic interactions, which accommodate individual strengths and needs. Katz and Assor (2007) suggest that fostering students' intrinsic motivation requires presenting learning activities in ways that satisfy their needs. Teachers can support autonomy by offering students choices, allowing them to select activities, courses of action, or contexts that resonate with their preferences. This autonomy-supportive environment, as Patall (2013) and Patall et al. (2013) have shown, enhances students' sense of agency and satisfaction by presenting learning activities in autonomy-supportive ways.

Furthermore, by fostering collaboration and enabling real-time feedback, SMART boards create participatory learning spaces where students actively construct knowledge instead of passively receiving it (Tsayang, Batane & Majuta, 2020). Thus, SMART board activities represent a promising approach to enhancing engagement and creativity in Drama and Theatre education, especially within Open Distance Learning (ODL) contexts, where students often face unique challenges in maintaining motivation and connection to the learning process.

The group structure of the activity ensured that each student had an active voice, fostering a collaborative and creative environment. As research and problem definition evolved, students gravitated toward specific challenges, forming groups based on personal interests rather than skill levels. This structure encouraged greater personal investment, boosting both accountability and teamwork (Gqwabaza & Maqoqa, 2024). It was apparent that the student-teachers were putting effort into creating engaging activities. For example, Group A designed a lesson on character profiles using traditional folk drama characters on the SMART Board. Students could drag and analyze elements to explore character traits, motivations, relationships, and backgrounds. This approach allowed students to select characters that resonated with their interests and reading levels. Group B used the SMART Board to create a storyboard and visual scene map by dragging and dropping elements to plot scenes, character entrances, and stage directions. Group C developed a set design for a scene, allowing students to visually represent their ideas and conduct historical research, blending art with drama analysis. However, some groups' activities lacked interactivity and did not meet the same standard.

SMART board technology introduced a new level of interactivity, which particularly benefited students with limited digital literacy. The hands-on, visual nature of SMART boards motivated these students to engage actively, with feedback indicating increased confidence and enthusiasm for using technology. For many students, SMART boards offered an accessible entry into digital engagement, enabling them to participate in meaningful technology-enhanced activities.

This personalized learning approach allowed each group to approach lessons from unique perspectives aligned with their creative strengths, enhancing engagement and critical thinking skills (Adams & Mullen, 2022). Using SMART boards to design and present lessons tailored to diverse learning needs provided students with practical experience in adapting content for varied learners. This experience equipped pre-service teachers with essential skills in using technology to support personalized learning, ultimately preparing them to engage students meaningfully in their future classrooms (Garcia & Soto, 2020).

All student-teachers requested that the school adopt this hands-on learning approach, rather than relying solely on face-to-face sessions with PowerPoint slides led by academic staff. They expressed that such practical experiences motivated them to use digital tools confidently and become more proficient. Out of 34 students, 8 reported lacking access to digital devices, such as desktops or laptops.

Some challenges in digital management also emerged. During registration, each student received an official email address, but five out of 35 student-teachers struggled to access their accounts due to forgotten passwords, as they had not logged in since registration. With help from their peers and the lecturer, they were able to reset their accounts. A random email inbox check, conducted with participants' consent, revealed that most emails were promotional, mainly from services like Uber Eats, with little academic content. Many inboxes had over a thousand unread emails, primarily delivery promotions or commercial messages, underscoring the need for improved digital management skills and effective academic email use (Brown & Reed, 2021).

## **DISCUSSION**

The findings indicate that personalized learning via SMART Board technology significantly enhances student agency and creativity, particularly when students have opportunities to shape their educational experiences (Schwartz et al., 2022). The SMART Board fosters this agency by enabling students to engage with course content interactively, encouraging creative thinking and problem-solving. Through structured and collaborative activities, students explored multiple perspectives, took ownership of their learning, and bridged connections between classroom activities and real-world applications. This sense of autonomy and purpose is critical in promoting long-term engagement and cultivating critical thinking skills.

For students with limited technological experience, the SMART Board provided a valuable entry point, translating complex drama concepts into accessible and engaging formats (Bond & Bedenlier, 2019). By incorporating interactive elements such as drag-and-drop character analysis, digital storyboarding, and visual set design, the SMART Board transformed abstract ideas into tangible learning experiences. This approach facilitated student engagement with traditional drama content, enhancing their understanding of key components like character motivation, narrative structure, and staging—all essential elements in drama education.

The study also emphasizes the value of curriculum adaptation that leverages both creative and technological tools to develop essential skills such as problem-solving, collaboration, and adaptability. These skills are increasingly critical in preparing students for practical, real-world applications (Kang & Patel, 2023). Although the primary objective was to engage students through Drama and Theatre, integrating Design Thinking and SMART Board technology broadened the educational impact. This alignment with educational goals to prepare students for complex real-world challenges highlights the broader relevance of the approach.

Through these personalized and interactive SMART Board activities, drama lessons became more dynamic, fostering student ownership over their learning. The SMART Board supported various creative and cognitive skill levels, allowing each student to engage meaningfully. Its interactive features encouraged students to approach content from a creative, problem-solving standpoint, making learning experiences immersive and personally relevant. For students with minimal digital experience, the SMART Board made technology approachable by presenting complex ideas through visually engaging, hands-on formats (Patall, 2013).

However, these promising results also reveal challenges, particularly concerning limited access to digital resources. With only 26 out of 34 student-teachers having access to a desktop or laptop, there is a clear gap that could impact the broader adoption of technology-driven education. In resource-constrained environments, educators may need to adopt additional strategies to promote equitable access, such as using mobile-friendly digital tools or shared device initiatives. Additionally, issues with digital management emerged, as some students had not accessed their email accounts since registration, and many were unfamiliar with using email effectively for academic purposes. This underscores the need for foundational digital literacy alongside content-based technology training (Brown & Reed, 2021).

Future research could investigate SMART Board applications across other ODL disciplines, especially those where interactive, visual tools could enhance learning for diverse and geographically dispersed students. Expanding on these findings could deepen our understanding of how SMART Board technology and personalized learning approaches address varied educational needs, ultimately contributing to more inclusive and effective technology-driven teaching models in diverse learning environments.

## **CONCLUSION**

The study shows that integrating SMART Board technology within drama education significantly enhances student engagement, creativity, and agency, particularly for pre-service teachers. By fostering an interactive and hands-on learning environment, the SMART Board empowers students to explore and connect with drama content in a dynamic, meaningful way. This approach supports students' autonomy and critical thinking, bridging classroom learning with real-world applications and preparing them for practical problem-solving and collaborative skills essential for future teaching roles.

For pre-service teachers with limited digital experience, SMART Boards offer a valuable entry point, making complex concepts in drama, such as character analysis, storyboarding, and set design, more accessible. This hands-on engagement

not only strengthens their understanding of content but also equips them with essential technological skills they can apply in their future classrooms. However, the study highlights challenges, including limited access to digital devices and a need for foundational digital literacy skills, both of which are essential for successful, broader implementation. Addressing these gaps through strategies like shared resources, mobile-friendly tools, and digital literacy support will be critical.

In drama education, particularly for pre-service teachers, this study suggests that interactive, technology-enhanced approaches can enrich learning experiences, support personalized engagement, and better prepare students for real-world teaching environments. Expanding the application of SMART Boards across educational contexts could further demonstrate their value in developing inclusive, adaptable, and effective teaching models that meet the diverse needs of future educators.

## REFERENCES

1. Alexander, B., Ashford-Rowe, K., Barajas-Murphy, N., Emerick, S., Galanek, J., Giedt, T., ... & Weber, N. (2019). EDUCAUSE Horizon Report: 2019 Higher Education Edition. EDUCAUSE. <https://library.educause.edu/-/media/files/library/2019/4/2019horizonreport>
2. Alisauskiene, S., Guðjónsdóttir, H., Kristinsdóttir, J. V., Connolly, L., Walton, E., & O'Donnell, A. (2020). Personalised learning within teacher education: A framework and guidelines (In-Progress Reflection No. 37 on Current and Critical Issues in Curriculum, Learning and Assessment). UNESCO International Bureau of Education. <https://unesdoc.unesco.org/ark:/48223/pf0000374043>
3. Anderson, T. (Ed.). (2008). The theory and practice of online learning. Athabasca University Press. [https://www.aupress.ca/app/uploads/120146\\_99Z\\_Anderson\\_2008-Theory\\_and\\_Practice\\_of\\_Online\\_Learning.pdf](https://www.aupress.ca/app/uploads/120146_99Z_Anderson_2008-Theory_and_Practice_of_Online_Learning.pdf)
4. Artino, A. R. (2007). Self-regulated learning in online education: A review of the empirical literature. *International Journal of Instructional Technology and Distance Learning*, 4(6). [https://www.itdl.org/Journal/Jun\\_07/article01.htm](https://www.itdl.org/Journal/Jun_07/article01.htm)
5. Barak, M. (2010). Motivating self-regulated learning in technology education. *International Journal of Technology and Design Education*, 20(4), 381–401. <https://doi.org/10.1007/s10798-009-9105-6>
6. Beauchamp, G., & Kennewell, S. (2010). Interactivity in the classroom and its impact on learning. *Computers & Education*, 54(3), 759–766. <https://doi.org/10.1016/j.compedu.2009.09.033>
7. Bond, M., & Bedenlier, S. (2019). Facilitating student engagement through educational technology: Towards a conceptual framework. *Journal of Interactive Media in Education*, 2019(1), 11. <https://doi.org/10.5334/jime.528>
8. Clark, R. C., & Lyons, C. (2010). Graphics for learning: Proven guidelines for planning, designing, and evaluating visuals in training materials. John Wiley & Sons.
9. Delfino, M., Dettori, G., & Persico, D. (2008). Self-regulated learning in virtual communities. *Technology, Pedagogy and Education*, 17(3), 195–205. <https://doi.org/10.1080/14759390802383819>
10. Denton, P., Madden, J., Roberts, M., & Rowe, P. (2008). Students' response to traditional and computer-assisted formative feedback: A comparative case study. *British Journal of Educational Technology*, 39(3), 486–500. <https://doi.org/10.1111/j.1467-8535.2007.00745.x>
11. Efklides, A. (2011). Interactions of metacognition with motivation and affect in self-regulated learning: The MASRL model. *Educational Psychologist*, 46(1), 6–25. <https://doi.org/10.1080/00461520.2011.538645>
12. Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107–115. <https://doi.org/10.1111/j.1365-2648.2007.04569.x>
13. Fitzgerald, M. S., & Evans, K. B. (2024). Integrating digital tools to enhance access to learning opportunities in project-based science instruction. *TechTrends*, 68, 882–891. <https://doi.org/10.1007/s11528-024-00975-w>
14. Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74(1), 59–109. <https://doi.org/10.3102/00346543074001059>



15. Garaigordobil, M. (2006). Intervention in creativity with children aged 10 and 11 years: Impact of a play program on verbal and graphic-figural creativity. *Creativity Research Journal*, 18(3), 329–345. [https://doi.org/10.1207/s15326934crj1803\\_8](https://doi.org/10.1207/s15326934crj1803_8)
16. Geddes, D. (2009). How am I doing? Exploring online gradebook monitoring as a self-regulated learning practice that impacts academic achievement. *Academy of Management Learning & Education*, 8(4), 494–510. <https://doi.org/10.5465/amle.8.4.zqr494>
17. Gqwabaza, N., & Maqoqa, T. (2024). The role of collaboration and networking in the digital age: Students' perspectives. *E-Journal of Humanities, Arts and Social Sciences*, 11(11), 1757–1769. <https://doi.org/10.38159/ehass.202451111>
18. Gunawardena, C. N., & McIsaac, M. S. (2004). Distance education. In D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (2nd ed., pp. 355–395). Lawrence Erlbaum Associates.
19. Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81–112. <https://doi.org/10.3102/003465430298487>
20. Hopkins, D. (2010). Personalized learning in school age education. In P. Peterson, E. Baker, & B. McGaw (Eds.), *International encyclopedia of education* (3rd ed.). Elsevier. <https://doi.org/10.1016/B978-0-08-044894-7.01073-3>
21. Kang, E., Patel, D., Saini, S., & Sandhu, M. (2023). What motivates people to donate used technology? SUSTAIN 4S06 A/B: Leadership in Sustainability, 1–16. <https://asp.mcmaster.ca/app/uploads/2024/01/What-Motivates-People-to-Donate-Used-Technology.pdf>
22. Katz, I., & Assor, A. (2007). When choice motivates and when it does not. *Educational Psychology Review*, 19(4), 429–442. <https://doi.org/10.1007/s10648-006-9027-y>
23. Klopov, I., Shapurov, O., Voronkova, V., Nikitenko, V., Oleksenko, R., Khavina, I., & Chebakova, Y. (2023). Digital transformation of education based on artificial intelligence. *TEM Journal*, 12(4), 2625–2634. <https://doi.org/10.18421/TEM124-74>
24. Lee, M. H., & Tsai, C. C. (2024). Technology-supported learning in secondary and tertiary education: A review of research from 2005 to 2012. *Educational Technology & Society*, 16(1), 159–170.
25. Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). Cambridge University Press.
26. Mayer, R. E. (2021). Evidence-based principles for how to design effective instructional videos. *Journal of Applied Research in Memory and Cognition*, 10(2), 229–240. <https://doi.org/10.1016/j.jarmac.2021.03.007>
27. Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. U.S. Department of Education. <https://www.ed.gov/sites/ed/files/rschstat/eval/tech/evidence-based-practices/finalreport.pdf>
28. Olugbade, D., Dare, R. F., & Tolorunleke, E. A. (2023). Examining the impact of interactive smart board use on technical students' learning outcomes in Nigerian higher educational institutions. *Journal of Education in Black Sea Region*, 8(2), 30–40. <https://doi.org/10.31578/jebs.v8i2.290>
29. Patall, E. A. (2013). Constructing motivation through choice, interest, and interestingness. *Journal of Educational Psychology*, 105(2), 522–534. <https://doi.org/10.1037/a0030307>
30. Patall, E. A., Dent, A. L., Oyer, M., & Wynn, S. R. (2013). Student autonomy and course value: The unique and cumulative roles of various teacher practices. *Motivation and Emotion*, 37(1), 14–32. <https://doi.org/10.1007/s11031-012-9305-6>
31. Plooy, E., Casteleijn, D., & Franzsen, D. (2024). Personalized adaptive learning in higher education: A scoping review of key characteristics and impact on academic performance and engagement. *Heliyon*, 10(21), e39630. <https://doi.org/10.1016/j.heliyon.2024.e39630>

32. Polit, D. F., & Beck, C. T. (2012). *Nursing research: Principles and methods*. Lippincott Williams & Wilkins.
33. Schleicher, A. (2018). Educating learners for their future, not our past. *ECNU Review of Education*, 1(1), 58–75. <https://doi.org/10.30926/ecnuoe2018010104>
34. Schwartz, N., Click, K., & Bartel, A. (2022). Educational psychology: Learning and instruction. In J. Zumbach, D. Bernstein, S. Narciss, & G. Marsico (Eds.), *International handbook of psychology learning and teaching*. Springer. [https://doi.org/10.1007/978-3-030-26248-8\\_67-1](https://doi.org/10.1007/978-3-030-26248-8_67-1)
35. Tian, X. (2024). Personalized translator training in the era of digital intelligence: Opportunities, challenges, and prospects. *Heliyon*, 10, e39354. <https://doi.org/10.1016/j.heliyon.2024.e39354>
36. Tsayang, G., Batane, T., & Majuta, A. (2020). The impact of interactive smart boards on students' learning in secondary schools in Botswana: A students' perspective. *International Journal of Education and Development Using Information and Communication Technology*, 16(2), 22–39. <https://files.eric.ed.gov/fulltext/EJ1268872.pdf>
37. Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *Educational Technology Research and Development*, 53(4), 5–23. <https://doi.org/10.1007/BF02504682>
38. Wang, S. K., Hsu, H. Y., Campbell, T., Coster, D. C., & Longhurst, M. (2014). An investigation of middle school science teachers and students' use of technology inside and outside of classrooms: Considering whether digital natives are more technology savvy than their teachers. *Educational Technology Research and Development*, 62, 637–662. <https://doi.org/10.1007/s11423-014-9355-4>.

**Citation:** Dr. Ayomi Indika Irugalbandara, Mr. M.D.B. Prasad Weerasinghe. *How Multimedia Learning Environments Enhance Understanding, Engagement, and Self-Regulated Learning*. *Int J Innov Stud Sociol Humanities*. 2025; 10(2): 1-10. DOI: <https://doi.org/10.20431/2456-4931.100201>.

**Copyright:** © 2025 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license