



Enhancing Digital Literacy Education for Undergraduate Students: A Multimodal Approach

Sorabh Bajaj*, Sheba Philip George
Flame University, India

Abstract

The growing importance of digital literacy in higher education necessitates the adoption of diverse pedagogical strategies to meet the evolving demands of students. This paper presents the design, execution and effectiveness of the Digital Literacy course for undergraduate students at a private University in India. We have used various educational technologies and learning elements, including reading materials, live lectures, recorded videos, SCORM packages, gamification techniques like Kahoot, and applied projects. This multimodal approach provides a comprehensive and engaging learning experience, promoting both theoretical understanding and practical application of digital skills. We conducted quantitative studies to understand the self-perceived knowledge level of Digital Literacy before and after the course. Qualitative studies were conducted to determine the effectiveness of the multimodal approach of the course. The results demonstrate a significant improvement in student engagement, learning outcomes and effectiveness.

Keywords: Digital literacy, blended learning, higher education, gamification, SCORM, applied projects.

1. Introduction

The digital revolution has transformed every aspect of human interaction, from regular communication to the workplace. As a result, there is an increasing need for educational institutions to focus on developing students' digital literacy (Ferrari, 2012). Digital literacy goes beyond technical skills; it encompasses the ability to critically evaluate digital content, understand online privacy concerns, and collaborate in digital environments (Hobbs, 2010). At Private University in India, the Digital Literacy course seeks to equip undergraduate students with these competencies through a carefully structured, multimodal approach.

This paper outlines the learning elements incorporated into the course, such as reading materials, live lectures, recorded videos, SCORM-compliant interactive modules, gamification techniques, and applied projects. The aim is to explore how these strategies, when combined, enhance student engagement and learning outcomes in digital literacy education.

2. Literature Review

2.1 Defining Digital Literacy

Digital literacy, as defined by Eshet-Alkalai (2004), is the survival skill of the digital era, encompassing technical, cognitive, and emotional dimensions. It entails the ability to process information, communicate effectively, and critically assess digital content. Buckingham (2010) underscores the growing importance of media and digital literacy in higher education, advocating for students to be adept at navigating the complexities of the digital landscape.

Ng (2012) emphasizes that digital literacy extends beyond technical skills, identifying three key dimensions: technical, cognitive, and socio-emotional. Complementing these perspectives, Spires and Bartlett (2012) suggest that digital literacy involves fluency in creating, consuming, and sharing digital content, which fosters deeper engagement with digital tools and platforms.

The evolution of digital literacy education reflects the growing integration of technology into all aspects of life and work. Belshaw (2014) expands the concept by including eight elements of digital literacy: cultural, cognitive, constructive, communicative, confident, creative, critical, and civic. These elements underline the diverse competencies required to function effectively in the digital world.

2.2 Pedagogical Strategies in Digital Literacy Education

Pedagogical strategies in digital literacy education have evolved significantly, reflecting the diverse needs of learners in the digital age. Blended learning, combining face-to-face and online instruction, has been identified as an effective approach to fostering digital literacy. Garrison and Kanuka (2004) argue that blended learning promotes flexibility and self-paced learning, making it particularly effective for diverse learner populations. Allen and Seaman (2017) further found that courses employing blended learning models improve student engagement compared to traditional classroom settings.

Interactive tools like SCORM packages have been instrumental in enhancing digital literacy education by offering reusable, trackable, and accessible content (Moseley & Higgins, 2001). These tools enable personalized learning experiences, allowing students to engage more deeply with educational material. Additionally, the use of gamification has gained traction in higher education. Gamified elements such as points, badges, and leaderboards have been shown to increase motivation and engagement (Deterding et al., 2011). Tools like Kahoot, for instance, have proven effective in fostering dynamic classroom environments, making learning more interactive and enjoyable (Wang, 2015).

Collaborative learning strategies also contribute significantly to digital literacy education. Laurillard (2012) highlights the value of interactive and participatory learning environments that encourage students to co-create knowledge. Digital tools like Google Workspace and Microsoft Teams facilitate such collaborative learning by enabling real-time communication and content sharing, fostering teamwork and collective problem-solving skills.

2.3 Applied Projects in Learning

Applied or project-based learning bridges theory and practice by immersing students in real-world problem-solving activities. According to Barron et al. (1998), project-based learning enhances students' ability to apply theoretical concepts to practical scenarios, fostering critical thinking and problem-solving skills. Thomas (2000) supports this view, emphasizing the role of applied projects in improving knowledge retention and encouraging active engagement with course content.

Integrating digital tools into project-based learning further amplifies its impact. For example, using platforms like Trello and Slack allows students to manage projects collaboratively while leveraging digital tools to track progress and communicate effectively. McGrath and MacEwan (2014) highlight that applied projects incorporating digital tools can also prepare students for future workplace demands by developing their digital fluency.

Moreover, interdisciplinary projects, such as those combining digital literacy with sustainability or social sciences, encourage students to address complex societal challenges. According to Krajcik and Shin (2014), interdisciplinary project-based learning fosters deeper understanding and equips students with the skills to tackle multifaceted problems.

3. Teaching Learning for GenZ

The methodology for studying and enhancing teaching-learning experiences in digital literacy education must reflect the evolving technological landscape and the preferences of Generation Z (Gen Z). This group is characterized by their extensive use of technology, preference for visual and interactive content, and demand for practical, real-world applications in education (Seemiller & Grace, 2017). The following approaches outline the need to adapt pedagogy accordingly:

Integration of Technology:

Leveraging digital tools such as interactive SCORM-compliant modules, gamification, and Learning Management Systems (LMS) aligns with Gen Z's comfort and engagement with digital platforms. Previous studies have shown that SCORM modules enhance interactive learning (Moseley & Higgins, 2001), while gamification elements like Kahoot increase motivation and participation (Wang, 2015).

Data-Driven Insights:

Analyzing LMS reports, quiz performance, and student feedback can provide critical insights into how students interact with the course content. Such data can be used to refine teaching strategies and ensure they meet the learning objectives effectively (Ferrari, 2012).

Project-Based Learning (PBL):

Emphasizing real-world projects that allow students to apply theoretical knowledge aligns with Gen Z's career-oriented mindset and need for practical relevance. PBL fosters problem-solving and critical thinking skills, which are crucial for navigating digital landscapes (Barron et al., 1998).

4. Learning Experiences

4.4 Quantitative Data Collection

Sample size

This study was conducted for first year undergraduate students of Private University in India. Around 114 students participated in the survey. The students are from different backgrounds and different parts of the country.

Tool for Data Collection

An online questionnaire was given to students at the start of the Digital Literacy course to help students understand where they are in their digital learning journey. The same questionnaire was given to the students at the end of the course to understand if the course has been effective and if there is any improvement in the skills gained.

The questionnaire had 8 questions related to topics such as Digital Footprints, online safety, effective communication, Excel, Data, CSS, HTML and Google workspace. A likert scale was used to measure the students' understanding of the subject. Students were required to rate themselves on a scale of 1 to 5, where 1 indicated strongly disagree and 5 indicated, strongly agree.

4.5 Data Analysis and Interpretation

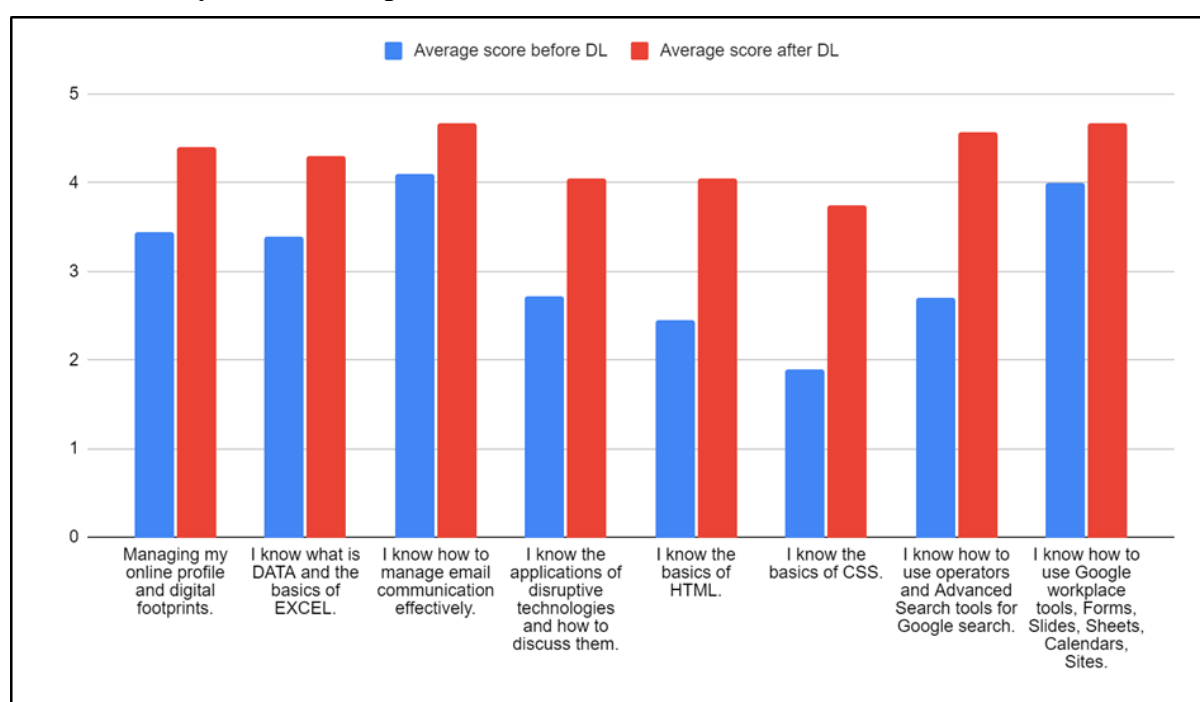


Figure 1: Comparative scores of self-perception of Digital Literacy Knowledge levels before and after the course

The data highlights a significant improvement in the self-perception of digital literacy levels across various topics after completing the course, demonstrating its effectiveness in enhancing participants' knowledge and skills. In the area of disruptive technologies, the average score increased from 2.7 (pre-course) to 4.05 (post-course), reflecting substantial growth in understanding. This suggests that participants gained valuable insights into emerging technologies capable of transforming industries and society. Similarly, scores in web basics improved from 2.4 to 4.05, representing a remarkable leap in foundational web literacy. This significant jump indicates that the course successfully clarified essential concepts and practices required for effective navigation and utilization of web platforms.

The improvement in the use of advanced search operators is particularly noteworthy, with knowledge levels rising by 50%. This likely stems from hands-on training and practical exercises that enabled participants to apply advanced search techniques for efficient and precise information retrieval. Such skills are crucial in today's information-rich environment, empowering users to extract relevant data quickly and enhancing their research and problem-solving abilities. Overall, the increase in scores across all topics indicates a comprehensive

enhancement in digital competencies. The notable advancements in disruptive technologies and advanced search operators highlight the course's focus on equipping participants with both cutting-edge knowledge and practical skills, fostering greater confidence and competence in digital literacy.

4.6 Qualitative Data collection

Sample size:

Small groups of students participated in a feedback session on the Digital Literacy Course. Around 70 students representing the first year undergraduate students were involved.

Tool for Data Collection:

Open-ended questions were posed to learners to gather qualitative insights into their experiences with the Digital Literacy course. These questions invited participants to share their perspectives on what they found beneficial, what aspects they disliked, and areas they believed could be improved. This feedback approach provided a platform for learners to reflect on their journey and contribute valuable input for the course's enhancement.

Participants were encouraged to express what they liked about the course, such as specific topics, teaching methods, or resources that resonated with them. This helped identify elements that were particularly effective in facilitating learning and engagement. At the same time, learners were asked to highlight any challenges or aspects they disliked, such as difficulties with certain topics, the pace of instruction, or the usability of course materials. These responses shed light on potential obstacles that might hinder the learning experience.

Additionally, participants shared suggestions for improvement, offering constructive feedback to refine the course further. This could include recommendations for additional content, more practical exercises, enhanced interactivity, or alternative delivery methods to cater to diverse learning styles. By discussing their experiences openly, learners contributed to a comprehensive understanding of the course's strengths and areas for development.

Such discussions are invaluable in shaping a learner-centered approach, ensuring that future iterations of the course are better aligned with participants' needs and expectations. The insights gathered through these open-ended questions serve as a foundation for continuous improvement, ultimately enhancing the course's effectiveness and impact on digital literacy.

Data Analysis and Interpretation:

The course feedback from student learners revealed an overwhelmingly positive reception, with 90% expressing approval for the course's innovative and hybrid structure. This multimodal approach effectively combined various methods of teaching to engage and address the diverse learning preferences of students. Highlights included self-paced videos, interactive discussions, group activities, educational games such as Kahoot, expert-led lectures, knowledge checks, and SCORM packages. These elements were repeatedly mentioned in student feedback, underscoring their appeal and effectiveness in making the learning process more dynamic, flexible, and inclusive.

The hybrid nature of the course, blending online and offline classes, catered well to different learning styles. Self-paced videos were particularly valued for their accessibility, enabling students to revisit and reinforce foundational concepts at their own pace. Practical and relevant

projects and assignments further enriched the learning experience, earning praise for their applicability to real-world scenarios.

When asked about aspects of the course that could be stopped, 80% of students reported satisfaction with the existing structure, indicating that the current blend of methodologies was largely successful. However, there was a split in preferences regarding the balance of offline and online classes. Some students favored an increase in offline classes for face-to-face interaction, while others preferred to minimize or eliminate them due to challenges posed by large class sizes, which may have impeded personalized engagement.

For areas of improvement, some learners recommended adding more quizzes to reinforce learning and promote active recall. There was also a suggestion to facilitate smaller group interactions to enhance engagement, personalize feedback, and create a more supportive and collaborative environment. This feedback highlights opportunities for fine-tuning the learning experience to ensure even greater accessibility and engagement across different student needs and preferences.

5 Results

The implementation of a multimodal approach for digital literacy education demonstrated significant improvements in student engagement and learning outcomes:

6.1 Increased Student Engagement:

A survey showed that 80% of students found the course engaging, attributing this to gamification and the practical applications in project-based assignments.

6.2 Enhanced Learning Outcomes:

Comparative self-assessment scores showed marked improvements (35-50%) across key competencies. This aligns with findings from Ng (2012) on the effectiveness of blended learning for digital skill acquisition.

6.3 Positive Feedback on Pedagogy:

Qualitative feedback highlighted the appeal of interactive content, with 90% of participants recommending the continuation of gamification and real-world projects. Suggestions for improvement included more quizzes and enhanced face-to-face interactions in smaller groups.

6 Discussion

The results indicate that the integration of multiple learning strategies—reading materials, live and recorded lectures, SCORM packages, gamification, and applied projects—successfully enhanced student engagement and learning outcomes. Gamification, in particular, proved effective in motivating students and fostering a sense of competition that reinforced their understanding of digital concepts. Similar studies have reported the positive effects of gamification on student motivation and engagement (Lee & Hammer, 2011).

The success of applied projects in bridging theory and practice was evident in the students' performance in their digital portfolios and group projects. These findings support the work of Barron et al. (1998), which suggests that project-based learning enhances critical thinking and problem-solving skills.

The results validate the efficacy of a multimodal teaching approach tailored to the technological adeptness and learning preferences of Gen Z students. This method combines theoretical

instruction with interactive and practical learning tools, resonating with Gen Z's need for experiential education (Seemiller & Grace, 2017).

Gamification and Engagement: The study corroborates previous research that gamified elements significantly enhance motivation and participation in digital literacy courses (Deterding et al., 2011; Wang, 2015).

Project-Based Learning: The success of applied projects aligns with the framework proposed by Barron et al. (1998), highlighting the importance of bridging theory and practice to develop critical skills.

Scope for Improvement: While the hybrid course structure was well-received, feedback suggests a need to explore personalized learning paths and small-group interactions to cater to diverse preferences.

Future research should focus on the long-term impact of such strategies on students' professional competencies, as well as their adaptability in evolving digital ecosystems.

7 Conclusion

This paper has outlined the multimodal approach used in teaching digital literacy to undergraduate students at Private University in India. The incorporation of diverse learning elements—reading materials, live lectures, recorded videos, SCORM packages, gamification, and applied projects—has been shown to significantly enhance student engagement and learning outcomes. The results suggest that this blended learning approach is effective in preparing students to navigate the digital world with confidence and critical awareness. Future studies should explore the long-term impact of such pedagogical strategies on students' digital literacy and adaptability in professional contexts.

References

- Allen, I. E., & Seaman, J. (2017). Digital learning compass: Distance education enrollment report 2017. Babson Survey Research Group. <https://doi.org/10.1080/10508406.1998.9672056>
- Barron, B. J., Schwartz, D. L., Vye, N. J., Moore, A., Petrosino, A., Zech, L., & Bransford, J. <https://doi.org/10.1080/10508406.1998.9672056>
- D. (1998). Doing with understanding: Lessons from research on problem- and project-based learning. *The Journal of the Learning Sciences*, 7(3-4), 271-311.
- Barron, B., Schwartz, D. L., Vye, N. J., Moore, A., Petrosino, A., Zech, L., & Bransford, J. D. (1998). Doing with understanding: Lessons from research on problem- and project-based learning. *The Journal of the Learning Sciences*, 7(3-4), 271-311.
- Belshaw, D. (2014). The essential elements of digital literacies. Durham University.
- Buckingham, D. (2010). Defining digital literacy: What do young people need to know about digital media? In J. Coiro, M. Knobel, C. Lankshear, & D. J. Leu (Eds.), *Handbook of research on new literacies* (pp. 59-79). Routledge.
- Buckingham, D. (2010). The future of media literacy in the digital age. Polity.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification". *Proceedings of the 15th International Academic MindTrek Conference*, 9-15. <https://doi.org/10.1145/2181037.2181040>

- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification." In Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments (pp. 9–15). ACM. <https://doi.org/10.1145/2181037.2181040>
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification". In Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments (pp. 9-15). <https://doi.org/10.1145/2181037.2181040>
- Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, 13(1), 93–106.
- Ferrari, A. (2012). Digital competence in practice: An analysis of frameworks. JRC Technical Reports.
- Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, 7(2), 95–105. <https://doi.org/10.1016/j.iheduc.2004.02.001>
- Hobbs, R. (2010). Digital and media literacy: A plan of action. Aspen Institute.
- Krajcik, J. S., & Shin, N. (2014). Project-based learning. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (2nd ed., pp. 275–297). Cambridge University Press. <https://doi.org/10.1017/CBO9781139519526.018>
- Laurillard, D. (2012). *Teaching as a design science: Building pedagogical patterns for learning and technology*. Routledge.
- Lee, J. J., & Hammer, J. (2011). Gamification in education: What, how, why bother? *Academic Exchange Quarterly*, 15(2).
- Moseley, D., & Higgins, S. (2001). *Ways forward with ICT: Effective pedagogy using information and communications technology for literacy and numeracy in primary schools*. Teacher Training Agency.
- Moseley, D., & Higgins, S. (2001). *Ways forward with ICT: Effective pedagogy using information and communications technology for literacy and numeracy in primary schools*. University of Newcastle.
- Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education*, 59(3), 1065–1078. <https://doi.org/10.1016/j.compedu.2012.04.016>
- Ng, W. (2012). Can we teach digital natives digital literacy? *Computers & Education*, 59(3), 1065–1078. <https://doi.org/10.1016/j.compedu.2012.04.016>
- Seemiller, C., & Grace, M. (2017). *Generation Z goes to college*. Jossey-Bass. <https://doi.org/10.4324/9780429442476>
- Spires, H. A., & Bartlett, M. E. (2012). *Digital literacies and learning: Designing a path forward*. Friday Institute White Papers, 5.
- Thomas, J. W. (2000). *A review of research on project-based learning*. Autodesk Foundation.
- Wang, A. I. (2015). The wear out effect of a game-based student response system. *Computers & Education*, 82, 217–227. <https://doi.org/10.1016/j.compedu.2014.11.004>