

Multimodal literacy in higher education: Bridging digital and communicative competencies

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Abstract: In an era of digital transformation, higher education must adapt to new modes of communication and information processing. This study explores the role of multimodal literacy as a critical competency for university students, emphasizing its integration into academic learning and higher education. The research investigates students' ability to interpret, produce, and critically assess multimodal content across digital platforms. Utilizing a quantitative approach, the study incorporates survey data to assess students' preparedness and challenges in engaging with multimodal resources. Findings highlight discrepancies between assumed digital proficiency and actual multimodal competence, suggesting a need for structured pedagogical interventions. The study also points to the significance of equipping students with the skills necessary to navigate contemporary communication landscapes effectively. Practical recommendations are proposed for enhancing curricula to support the development of multimodal literacy in higher education.

Keywords: multimodal literacy; academic competencies; digital proficiency; technological adaptation

1. Introduction

Literacy has always been a fundamental aspect of education, shaping individuals' ability to communicate, process information, and engage with society [1]. In the 21st century, the definition of literacy has expanded beyond the traditional focus on reading and writing to encompass a broader range of competencies [2]. The rapid advancement of technology and the growing digitalization of information have necessitated a shift toward more dynamic and adaptable literacy skills [3]. As a result, individuals must develop the ability to navigate, interpret, and produce content across multiple modes of communication, including text, visuals, audio, and digital media [4]. This transformation has led to the emergence of digital and multimodal literacy, which extend beyond conventional literacy practices [5]. Digital literacy involves the ability to critically evaluate and effectively use digital technologies [6], while multimodal literacy refers to the ability to interpret and create meaning through multiple forms of communication [7]. The increasing presence of multimedia content, online platforms, and interactive digital tools has made these literacies essential for students in higher education. As academic environments incorporate diverse modes of information dissemination, there is a growing need to equip students with the skills necessary to engage with complex, multimodal texts [8].

This paper aims to explore the significance of multimodal literacy in higher education, emphasizing its role in student learning and academic success. By assessing students' preparedness and identifying potential challenges, the study seeks to provide insights into the current state of multimodal literacy among university students. Furthermore, it highlights the importance of integrating multimodal literacy instruction into curricula to better support student engagement and comprehension. The findings will contribute to the ongoing discourse on digital education and propose strategies for fostering multimodal competence in contemporary academic settings.

2. Theoretical background

Literacy can be defined as the mastery of simple and practical skills that enhance and transform human thinking abilities [9]. In the 21st century, with the emergence of new technologies and web tools, new technological skills and knowledge are needed in the labor market, and not only in technology-oriented jobs [10]. New literacies have developed or been redefined according to the principles of lifelong learning, which has been transformed under the influence of technological innovations, making digital literacy one of the key competencies of this era.

The concept of digital literacy dates back to the 1960s and has evolved alongside technological changes. Initially, new literacy referred to the visual perception, interpretation, and communication of information. Reddy et al. [9] defined this concept as 'visual literacy', i.e., the ability to produce and interpret visual messages across various media to communicate effectively. In the 1970s, the term 'technological literacy' emerged, encompassing changes brought by technological innovations of the time [9]. However, this term was limited to technical knowledge about using specific technology and did not include meta-skills such as decision-making or critical evaluation of technology's potential and impact. By the late 1970s, with the advent of personal computers, 'computer literacy' appeared, referring to the ability to understand computer functions and applications and apply this knowledge to enhance productivity [9, 10]. The next stage in the evolution of this concept involved knowledge of programming languages and software, termed 'ICT literacy' [11]. Finally, at the end of the 20th century, the growing use of digital technology necessitated a broader concept. With the rise of web technologies and internet access, digital media came to the forefront, making 'digital literacy' the most relevant term for describing this technological evolution. Glister [12] first used this term in 1997, defining it as the ability to understand and use information in multiple formats from a wide range of sources available on the internet.

Different authors offer various definitions of digital literacy, but they all agree that the concept is multidimensional and involves a complex integration of technical skills, cognitive skills, metacognitive processes, civic engagement, and ethical awareness [8, 10, 11]. For the purposes of this paper, digital literacy is defined as an individual's ability to find and evaluate information, use information effectively, create new content using that information, and share or communicate this newly created information using appropriate digital technologies [9]. A digitally literate person should possess the following abilities:

- Comprehensive knowledge of digital technology and its applications;
- Various skills (technical and cognitive) for finding and critically evaluating digital information using search strategies;
- Understanding of personal privacy and appropriate communication with others via digital technology;
- Active participation in civic society and contribution to an informed society, including self-motivation to seek and share information and learn new skills; and
- Consideration of the impact and longevity of digital information before publishing it, ensuring the protection of the public and individuals [9].

2.1. Conceptualizing multimodal literacy

Multimodal literacy refers to the ability to interpret, create, and communicate meaning across multiple modes, such as text, images, audio, video, and digital media [4]. Unlike traditional literacy, which primarily focuses on reading and writing, multimodal literacy recognizes that meaning is often conveyed through a combination of visual, auditory, and textual elements [7]. This broader scope is essential for navigating today’s digital landscape, where communication often involves various media forms integrated seamlessly.

Although digital literacy and multimodal literacy overlap, they differ in their focus and applications (**Table 1**). Digital literacy encompasses the ability to use and critically engage with digital technologies, whereas multimodal literacy emphasizes the integration of different communication modes to construct meaning [8,11]. Digital literacy often involves technical and cognitive skills, while multimodal literacy extends to semiotic awareness and the ability to decode and produce meaning across various representational forms [13,14].

Table 1. Key elements and applications of digital and multimodal literacy.

Aspect	Digital literacy	Multimodal literacy
Definition	The ability to use, evaluate, and create digital content using digital tools	The ability to interpret, analyze, and produce messages using multiple modes
Core Elements	Technical skills, information literacy, digital communication, safety	Visual literacy, audio-visual integration, spatial understanding, critical literacy
Primary Modes	Text, images, video, software/applications	Text, images, gestures, sounds, spatial arrangements
Key Competencies	Navigating digital platforms, evaluating credibility, creating digital content	Understanding multimodal texts, combining modes for meaning-making
Typical Applications	Bloggng, social media use, online research, e-learning platforms	Infographics, video essays, digital storytelling, multimedia presentations
Educational Context Use	Online learning tools, digital portfolios, LMS engagement	Interpretative reading, collaborative media projects, critical content creation

Multimodal communication plays a crucial role in contemporary education by enhancing student engagement and comprehension. The integration of multimodal texts in academic settings encourages critical thinking and creativity, enabling students to analyze and produce content in diverse formats [15]. As educational institutions increasingly adopt digital and interactive resources, fostering multimodal literacy becomes imperative for preparing students for both academic and professional environments where diverse communication skills are required [16].

2.2. Multimodal literacy in higher education

The terminology used in this field is diverse, reflecting how literacy has evolved within new communication methods, e.g., visual literacy, new literacies, digital literacies, multimodality, and multiliteracies [9]. In this paper, the term multimodal literacy is used to denote the skills required in new communication media for reading, listening, responding to, and producing multimodal and digital artifacts. Teaching has always been multimodal, as communication requires attention to various types of meaning, whether through spoken or written words, visual input, gestures, posture, movement, sound, or silence [7]. Nevertheless, it is undeniable that the capabilities of digital media and text production have increased the circulation of multimodal texts in networked digital environments. Multimodal text production has become a central part of everyday life for many people across different cultures and societies. This has been enabled by the ease of producing and sharing digital content such as images, music, video games, applications, and more via the internet and mobile technologies.

The study of multimodal literacy instruction is a developing research field, beginning with the recognition that reading and writing are rarely practiced as isolated skills but are closely linked to the use of multimodal texts, often in digital contexts. This field emerges from the fundamental premise that literacy can no longer be considered merely as isolated reading and writing skills but is deeply intertwined with the use of various visual and audio elements, often in digital environments [14]. In contemporary society, students are exposed to numerous forms of multimodal communication on the internet, social media, and visual media, highlighting the importance of teaching multimodal literacy in higher education. The integration of digital tools and multimodal communication in higher education has transformed traditional teaching and learning methods. Educators now utilize various digital resources, such as multimedia presentations, online discussion forums, and interactive learning platforms, to facilitate a more engaging and dynamic learning experience [1]. By incorporating multimodal approaches, higher education institutions can cater to diverse learning styles and enhance knowledge retention among students.

Despite its benefits, incorporating multimodal literacy into higher education curricula presents challenges. Many educators face difficulties in adapting to new technologies and developing multimodal teaching strategies [17]. Additionally, institutional barriers, such as limited access to digital resources and inadequate professional development, hinder the seamless integration of multimodal approaches [18]. Addressing these challenges requires comprehensive training programs and supportive policies to enable effective implementation. Educators play a pivotal role in fostering multimodal skills among students by designing interactive learning activities that encourage critical engagement with various media forms [17]. Through collaborative projects, digital storytelling, and multimedia analysis, students can develop competencies essential for navigating modern communication landscapes [14, 15]. By embedding multimodal literacy within pedagogical practices, higher education institutions can better prepare students for future academic and professional challenges.

3. Methodology

3.1. Research design

Despite the increasing integration of digital tools and multimodal resources in higher education, students' actual preparedness for multimodal literacy remains uncertain. While it is often assumed that digital natives possess advanced skills in navigating, analyzing, and producing multimodal content, research suggests that their competencies may vary significantly. This study aims to assess the current state of multimodal literacy among higher education students, identifying potential gaps and challenges that need to be addressed in academic curricula. This study aims to address several key questions: 1) what the current level of multimodal literacy is among higher education students; 2) how they perceive their ability to engage with and produce multimodal content; 3) what challenges they face in developing multimodal literacy skills within academic settings; and finally; 4) what factors influence students' multimodal literacy competence. To further explore these research questions, the study tests the following hypotheses:

- 1) Higher education students demonstrate a preference for multimodal learning materials but lack advanced skills in producing multimodal content.

This hypothesis responds to Research Question 1, which investigates students' current level of multimodal literacy, by anticipating a discrepancy between consumption and production capabilities. It also informs Research Question 2, as it suggests that students' self-perceptions will reflect this imbalance—feeling more comfortable engaging with than creating multimodal texts. Furthermore, it supports Research Question 3, which explores challenges in skill development, by emphasizing that the production of multimodal content remains a significant hurdle despite students' frequent digital interactions.

- 2) Students who frequently engage with digital and multimodal resources outside academic settings exhibit higher levels of multimodal literacy in academic contexts.

This hypothesis addresses Research Question 4, which seeks to identify factors influencing multimodal competence, by proposing that informal digital engagement plays a critical role in shaping formal academic literacy outcomes.

This study employs a quantitative research design using the Multimodal Literacy Assessment Scale (**Appendix A**), a survey instrument developed to measure students' multimodal literacy competencies. The questionnaire consists of 12 Likert-scale items assessing digital and multimodal communication use, multimodal production skills, critical evaluation of multimodal content, and multimodal communication in learning and teaching. The survey aims to provide insights into students' experiences, preferences, and perceived competence in multimodal literacy.

3.2. Participants

A convenience sample of undergraduate students of the University of Priština in Kosovska Mitrovica ($N = 54$) from various disciplines was recruited for this study. The sample consisted of 61% female and 39% male students. Participation was voluntary,

ensuring an ethical and unbiased approach to data collection. The distribution of students by year of study was randomized, including 36% first-year students, 24% second-year students, 28% third-year students, and 12% fourth-year students. This diverse sample allows for a comprehensive understanding of multimodal literacy skills across different academic levels.

3.3. Data collection and analysis

Data were collected through an online questionnaire administered via a survey platform Google Forms. The questionnaire comprised four sections: 1) digital and multimodal communication use, assessing students' engagement with digital platforms, multimedia content, and digital communication tools; 2) multimodal production skills, evaluating students' ability to create multimodal content and combine different modes of communication; 3) critical evaluation of multimodal content, measuring students' competencies in analyzing and interpreting multimodal texts; and 4) multimodal communication in learning and teaching, investigating institutional support for multimodal assignments and students' perceptions of the relevance of multimodal literacy. Quantitative data were analyzed using descriptive statistics, including mean scores and standard deviation, to assess overall literacy levels. Additionally, correlation analysis was conducted to determine the relationships between multimodal exposure and literacy levels. The findings from this study provide empirical insights into students' multimodal literacy competencies and inform recommendations for curriculum development in higher education.

3.4. Limitations of the study design

While this study offers initial insights into students' multimodal literacy, several limitations of the research design must be acknowledged. The use of a quantitative survey instrument, the Multimodal Literacy Assessment Scale (MLAS), allowed for the identification of general patterns across key literacy dimensions; however, as a self-reported tool, it may be subject to bias in student responses and does not capture actual performance-based competencies. The choice of a convenience sample, though pragmatic for this pilot study, also limits the generalizability of the findings beyond the specific institutional context. Although efforts were made to align questionnaire items with widely accepted theoretical constructs in the field [8,13], formal statistical validation of the instrument (such as factor analysis or reliability testing through Cronbach's alpha) was not conducted at this stage. As such, the instrument should be viewed as an exploratory tool that requires further refinement. Future studies should incorporate more diverse sampling strategies and mixed-method approaches, including performance-based tasks and qualitative data, to gain a more comprehensive and reliable assessment of multimodal literacy in higher education. These enhancements will strengthen both the methodological rigor and the applicability of the findings to broader educational contexts.

The data collection procedure, which relied solely on an online questionnaire administered to a limited number of participants, further constrains the depth and diversity of the insights gathered. While this method offered logistical efficiency

and accessibility, it may not fully capture the complexity of students' multimodal experiences or competencies in practice. The absence of triangulated data, such as classroom observations, student artifacts, or follow-up interviews, limits the robustness of the conclusions. Future research would benefit from adopting a mixed-methods design that integrates qualitative inquiry, thereby enriching the dataset and enabling a more nuanced interpretation of how multimodal literacy is developed, perceived, and enacted across diverse educational settings.

4. Results

The analysis of the results from the first section of the questionnaire on student use of digital and multimodal communication (**Figure 1; Table A1**) indicates that students frequently use digital platforms for academic learning ($M = 4.2$, $SD = 0.8$) and show a strong preference for multimedia content over traditional text-based resources ($M = 4.1$, $SD = 0.7$). Additionally, students reported being comfortable navigating various digital tools for communication ($M = 3.9$, $SD = 0.9$). The correlation analysis suggests a moderate to strong positive relationship between multimodal exposure and literacy levels, with the highest correlation observed in the preference for multimedia content ($r = 0.60$). These findings show that while students actively engage with digital and multimodal communication tools, their familiarity with such platforms does not necessarily translate into advanced multimodal competencies. The positive correlations suggest that increased exposure to multimodal resources enhances literacy skills, supporting the hypothesis that frequent digital engagement fosters improved multimodal competence.

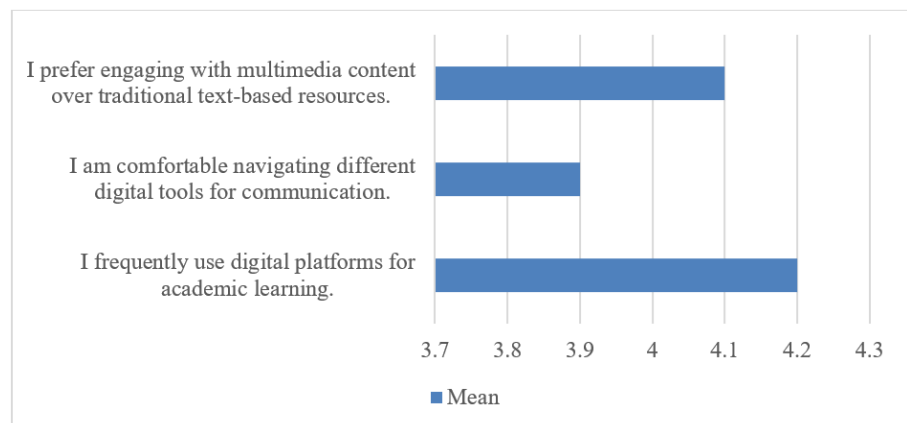


Figure 1. Digital and multimodal communication use.

The second section of the questionnaire was focused on student multimodal production skills (**Figure 2; Table A2**), the results indicate that students exhibit moderate confidence in their multimodal production skills. The highest mean score was for creating digital content for academic purposes ($M = 3.8$, $SD = 1.0$), followed by confidence in combining text, visuals, and audio to convey ideas ($M = 3.6$, $SD = 1.1$). The lowest mean score was for experience with digital storytelling tools ($M = 3.4$, $SD = 1.2$), suggesting that while students engage with digital media, their hands-on experience with advanced multimodal creation tools is limited. Correlation analysis shows a moderate positive relationship between multimodal production skills and literacy

levels, with the highest correlation found in confidence in combining different modes of communication ($r = 0.50$). These findings suggest that although students are exposed to multimodal communication, they may not receive sufficient training in producing complex multimodal texts. The moderate correlations indicate that increased practice with digital storytelling and multimedia composition could enhance students' overall multimodal literacy.

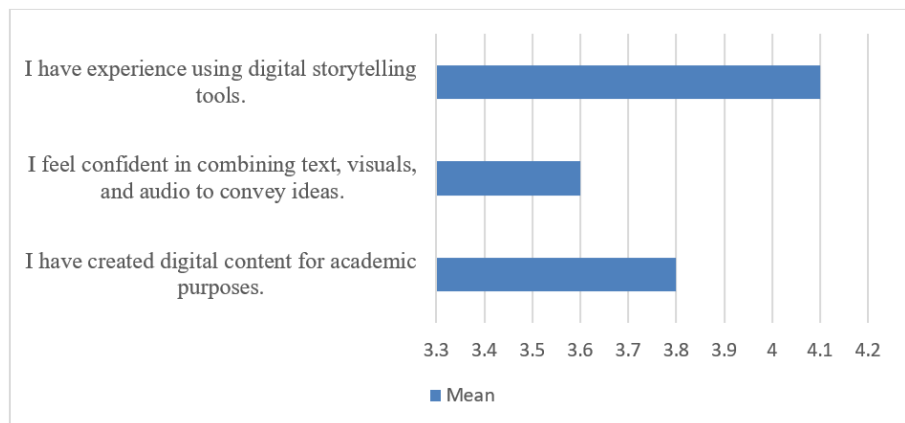


Figure 2. Multimodal production skills.

The next section examined the students' skills to critically evaluate multimodal content (**Figure 3; Table A3**) and the analysis indicates that students exhibit a strong ability to critically evaluate multimodal content, with the highest mean score for evaluating the credibility of online multimedia sources ($M = 4.0$, $SD = 0.9$). Understanding how different modes influence meaning in communication also scored relatively high ($M = 3.9$, $SD = 1.0$), while analyzing and interpreting multimodal texts had a slightly lower mean ($M = 3.7$, $SD = 1.1$). Correlation analysis suggests a moderate to strong relationship between critical evaluation skills and overall multimodal literacy, with the highest correlation found in assessing the credibility of online sources ($r = 0.58$). These findings tell us that students are relatively proficient in evaluating multimodal content, particularly in assessing source credibility. However, their ability to interpret and analyze multimodal texts is somewhat weaker, indicating a need for further instruction in deconstructing and critically engaging with complex multimodal materials.

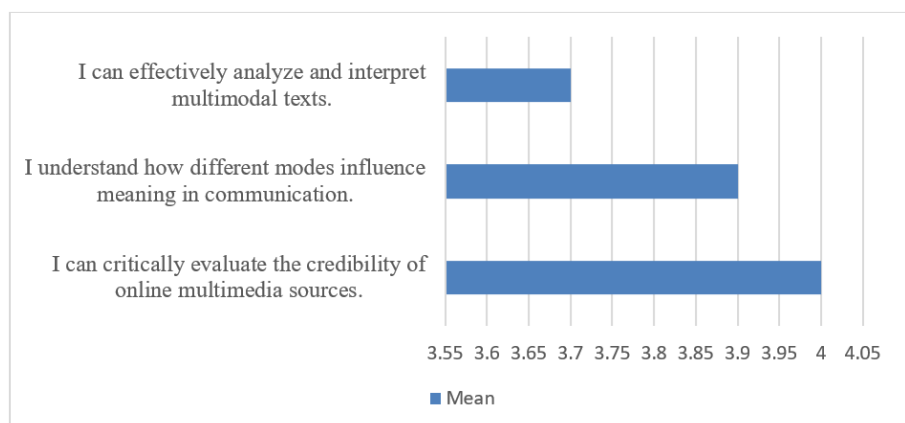


Figure 3. Critical evaluation of multimodal content.

Finally, the fourth section looked into student experience with multimodal communication in learning and teaching (**Figure 4; Table A4**) and the results suggest that while students recognize the importance of multimodal literacy for academic success ($M = 4.3$, $SD = 0.7$), the encouragement of multimodal assignments within university courses remains moderate ($M = 3.5$, $SD = 1.2$). Additionally, students expressed strong interest in improving their multimodal communication skills ($M = 4.1$, $SD = 0.8$). The correlation analysis shows a strong positive relationship between students' belief in the importance of multimodal literacy and their willingness to develop related skills ($r = 0.63$), as well as a moderate correlation between multimodal assignments and literacy competence ($r = 0.49$). Although students recognize the significance of multimodal literacy, institutional support in terms of coursework and assignments may be insufficient. The moderate correlation between course assignments and literacy competence suggests that greater integration of multimodal assignments into curricula could help bridge the gap between recognition of importance and practical skill development.

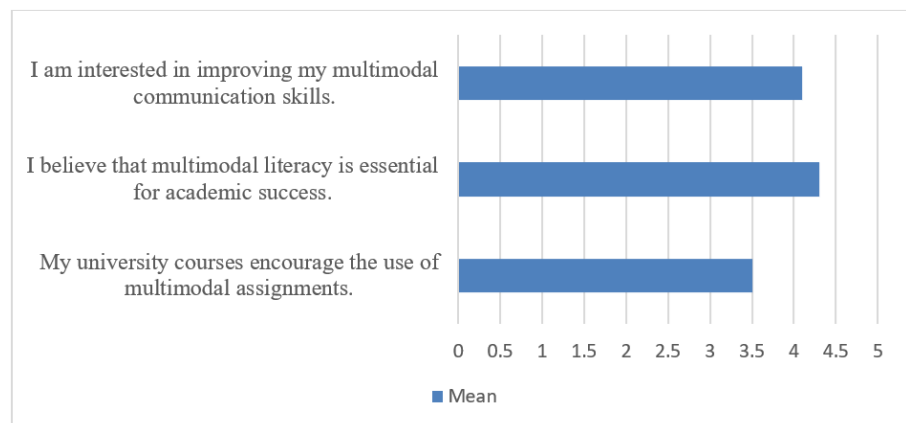


Figure 4. Multimodal communication in learning and teaching.

5. Discussion

The findings of this study align with previous research on multimodal literacy and its role in higher education. As Bezemer and Kress [13] argue, multimodal learning involves the interplay of multiple communication modes, which require not only consumption but also active production of digital content. Our results support this claim, as students demonstrated a strong preference for engaging with multimodal materials but showed moderate confidence in producing multimodal texts, corroborating the first hypothesis. Furthermore, the positive correlation between multimodal exposure and literacy levels supports the second hypothesis, suggesting that students who frequently interact with digital and multimodal resources develop higher competencies in this domain. Jewitt [8] emphasizes that multimodal literacy is increasingly essential in education, as students navigate a diverse range of digital tools and texts. However, our findings indicate that while students recognize the importance of multimodal literacy, they may lack formal training in applying these skills effectively.

The moderate institutional support for multimodal assignments, as highlighted in the results, aligns with Walsh [16], who argues that educators play a critical role in embedding multimodal literacy into curricula. Cope and Kalantzis [15] further

emphasize that a pedagogy of multiliteracies is essential for equipping students with the necessary skills to succeed in contemporary learning environments. This study implies that while higher education institutions acknowledge the value of multimodal literacy, more structured and immersive learning experiences are needed to bridge the gap between theoretical knowledge and practical application. Additionally, the correlation between students' belief in the importance of multimodal literacy and their willingness to develop these skills aligns with Alexander et al. [18], who argue that digital literacy initiatives must be integrated into academic curricula to maximize student engagement. Serafini [19] also highlights that reading and interpreting multimodal texts require critical analysis, a skill that should be reinforced through targeted educational strategies. Overall, these findings demonstrate the need for a more comprehensive approach to multimodal literacy instruction in higher education. By integrating more multimodal assignments and providing targeted training in digital content creation, institutions can better prepare students for the evolving demands of academic and professional communication.

The study attempted to address several research questions. The results provide a clearer picture of the current level of multimodal literacy in a limited sample, confirming that while students actively engage with multimodal content, their production skills remain underdeveloped. The study also highlights students' perceptions of their abilities, revealing a preference for multimodal learning but a lack of confidence in content creation. Additionally, the challenges identified, such as insufficient institutional support for multimodal assignments and a lack of structured training, provide insights into the barriers preventing students from developing higher competencies similarly to Walsh's conclusions [16]. The correlation analysis points toward the connection between frequent engagement with multimodal resources and literacy levels, reinforcing the importance of integrating multimodal learning into curricula as reported by Mills and Unsworth [7]. These findings contribute to a broader understanding of how higher education can enhance multimodal literacy instruction to better equip students for academic and professional success.

6. Implications for pedagogy and curriculum development

This study aimed at underlining the importance of structured learning experiences in fostering multimodal literacy. As Lim and Tan-Chia [20] emphasize, multimodal competency is not merely about exposure to digital content but requires guided instruction and deliberate practice. Implementing structured multimodal learning experiences enables students to develop critical analysis skills, improve their ability to create digital content, and engage with multimodal communication more effectively [13]. For effective integration of multimodal literacy, pedagogical shifts are necessary. Cope and Kalantzis [15] advocate for a pedagogy of multiliteracies, which moves beyond traditional text-based learning to include visual, audio, and digital modalities. This requires educators to adopt interactive teaching approaches, such as digital storytelling, collaborative multimedia projects, and critical analysis of multimodal texts. Furthermore, Walsh [16] highlights the role of educators in scaffolding students' engagement with multimodal content, ensuring that they not only consume but also critically engage with

and produce meaningful multimodal texts.

To enhance multimodal literacy in higher education, course design and assessment methods must be adapted. Alexander et al. [18] suggest incorporating multimodal assignments, such as video essays, interactive presentations, and digital portfolios, to assess students' ability to integrate multiple modes of communication effectively. Additionally, formative assessments, peer reviews, and self-reflection exercises can help students develop a deeper understanding of multimodal communication. Serafini [19] emphasizes that assessment should not only measure students' final outputs but also their process of multimodal meaning-making, encouraging creativity and critical thinking. By embedding structured multimodal learning experiences into curricula and adopting innovative assessment strategies, higher education institutions can better equip students with the competencies necessary to navigate contemporary digital communication landscapes. These recommendations align with the broader discourse on digital and multimodal literacy, reinforcing the need for comprehensive pedagogical strategies to support students in developing essential 21st-century skills.

7. Conclusion

This study provides a partial insight into the state of multimodal literacy among higher education students, revealing a strong preference for engaging with multimodal content but a lack of advanced production skills. The findings show the need for structured pedagogical interventions to bridge the gap between students' digital exposure and their ability to critically assess and create multimodal texts. Additionally, the positive correlation between frequent multimodal engagement and literacy competence underscores the importance of integrating multimodal learning into higher education curricula. Despite the contributions, this study has certain limitations. The sample size, while diverse, remains relatively small and limited to a single institution, which may affect the generalizability of the findings. Furthermore, the study relies primarily on self-reported data, which may introduce bias in assessing students' actual competencies.

While this pilot study offers a foundational perspective, further research could expand upon this by incorporating more robust technical evaluations of student competencies. These might include controlled experiments or task-based assessments that require students to interpret, produce, and assess multimodal content across diverse digital platforms. The use of advanced analytical tools, such as content analysis software or eye-tracking technology, may also help objectively measure engagement and comprehension. We acknowledge that integrating such approaches would represent a major methodological shift beyond the scope of the current study; however, they represent promising avenues for future inquiry that could yield deeper, data-driven insights into multimodal literacy development. Additionally, cross-institutional studies could provide comparative insights into best practices for integrating multimodal literacy into higher education curricula.

As digital and multimodal literacy demands continue to evolve, higher education must remain adaptable. The rapid advancements in digital communication require ongoing curriculum updates and professional development for educators to ensure that students are adequately prepared for contemporary academic and professional challenges.

Multimodal literacy is no longer an optional skill but a fundamental competency for 21st-century learners. Future research should explore longitudinal studies to assess how multimodal literacy develops over time and how institutional interventions influence student progress. Additionally, cross-institutional studies could provide comparative insights into best practices for integrating multimodal literacy into higher education curricula. By addressing these gaps, academia can better equip students with the skills necessary for success in an increasingly multimodal and digital world.

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Institutional review board statement: Ethical review and approval were waived for this study due to its minimal-risk design and focus on routine educational practice. The research involved anonymous quantitative data collected through voluntary course-related surveys, without sensitive personal information or any procedures beyond normal instruction. Data were analyzed only in aggregated form, and no participants could be identified, in line with institutional guidelines for low-risk educational research.

Informed consent statement: No sensitive personal data were collected, participation was voluntary, and respondents were informed about the purpose of the study and their right to decline participation without any academic consequences. All data were recorded and analyzed in aggregated form only, ensuring that individual participants could not be identified.

Data availability statement: The datasets generated and analyzed during the current study are not publicly available but are available from the corresponding author upon reasonable request.

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Conflict of interest: The author declares no conflict of interest.

Appendix A

Multimodal Literacy Assessment Scale (MLAS)

Instructions: Please respond to the following questions honestly based on your experience. Mark your answers from 1 (Strongly Disagree) to 5 (Strongly Agree).

Section 1: Digital and multimodal communication use

- 1) I frequently use digital platforms (e.g., websites, videos, podcasts) for academic learning.
- 2) I am comfortable navigating different digital tools for communication (e.g., email, discussion forums, collaborative documents).
- 3) I prefer engaging with multimedia content (videos, infographics, podcasts) over traditional text-based resources.

Section 2: Multimodal production skills

- 1) I have created digital content (e.g., presentations, videos, infographics) for academic purposes.
- 2) I feel confident in combining text, visuals, and audio to convey ideas effectively.

- 3) I have experience using digital storytelling tools (e.g., blogs, video editing software, interactive presentations).

Section 3: Critical evaluation of multimodal content

- 1) I can critically evaluate the credibility of online multimedia sources.
- 2) I understand how different modes (text, image, sound) influence meaning in communication.
- 3) I can effectively analyze and interpret multimodal texts such as infographics, advertisements, or interactive websites.

Section 4: Multimodal communication in learning and teaching

- 1) My university courses encourage the use of multimodal assignments (e.g., video essays, digital presentations).
- 2) I believe that multimodal literacy is essential for academic success in the digital era.
- 3) I am interested in improving my multimodal communication skills for future professional use.

Appendix B

Table A1. Digital and multimodal communication use.

Item	Mean	SD	Correlation
I frequently use digital platforms for academic learning.	4.2	0.8	0.56
I am comfortable navigating different digital tools for communication.	3.9	0.9	0.52
I prefer engaging with multimedia content over traditional text-based resources.	4.1	0.7	0.60

Table A2. Multimodal production skills.

Item	Mean	SD	Correlation
I have created digital content for academic purposes.	3.8	1.0	0.48
I feel confident in combining text, visuals, and audio to convey ideas.	3.6	1.1	0.50
I have experience using digital storytelling tools.	3.4	1.2	0.45

Table A3. Critical evaluation of multimodal content.

Item	Mean	SD	Correlation
I can critically evaluate the credibility of online multimedia sources.	4.0	0.9	0.58
I understand how different modes influence meaning in communication.	3.9	1.0	0.55
I can effectively analyze and interpret multimodal texts.	3.7	1.1	0.52

Table A4. Multimodal communication in learning and teaching.

Item	Mean	SD	Correlation
My university courses encourage the use of multimodal assignments.	3.5	1.2	0.49
I believe that multimodal literacy is essential for academic success.	4.3	0.7	0.63
I am interested in improving my multimodal communication skills.	4.1	0.8	0.61

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