

Moving from theory to practice: Applying the four meta-literacy model to the business communication classroom

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ABSTRACT

EN The multiple mixed-method case studies approach responds to the need for multimodal literacy and multiliteracies assessment in higher education to address the current digital workplace communication gap. The 4ML theoretical model for digital multimodal communication provided the basis for a scoring rubric and an analytical framework for multimodal content analysis. The model was an effective tool for diagnosing multimodal composers' literacy levels in digital literacy, multimedia skill literacy, multimodal design literacy, and rhetorical literacy. Additionally, the visual analysis of undergraduate multimodal slide decks provided qualitative insight into multiliteracies' strengths and gaps. The findings support the use of the 4ML model in business and professional communication classrooms to enhance digital multimodal communication competencies.

Key words: MULTIMODAL COMMUNICATION, MULTILITERACIES, MULTIMODAL LITERACY, DIGITAL LITERACY

ES Este estudio de casos múltiples y de método mixto responde a la necesidad de evaluar la alfabetización multimodal y las multialfabetizaciones en la educación superior para abordar la brecha de comunicación digital en el contexto laboral. El modelo teórico 4ML para la comunicación multimodal digital sentó las bases para una rúbrica de puntuación y un marco analítico para el análisis de contenido multimodal. El modelo resultó ser una herramienta eficaz para diagnosticar los niveles de alfabetización de los compositores multimodales en alfabetización digital, habilidades multimedia, diseño multimodal y retórica. Además, el análisis visual de presentaciones multimodales de estudiantes universitarios proporcionó una perspectiva cualitativa sobre las fortalezas y las deficiencias de la multialfabetización. Los hallazgos respaldan el uso del modelo 4ML en las aulas de comunicación empresarial y profesional para mejorar las competencias de comunicación multimodal digital.

Palabras clave: COMUNICACIÓN MULTIMODAL, MULTIALFABETIZACIONES, ALFABETIZACIÓN MULTIMODAL, ALFABETIZACIÓN DIGITAL

IT Lo studio, di casi diversi e condotto con metodo misto, risponde alla necessità di valutare le alfabetizzazioni multimodali e multiple a livello d'istruzione superiore, per far fronte al divario di comunicazione digitale sul posto di lavoro. Il modello teorico 4ML per la comunicazione digitale multimodale ha posto le basi per una rubrica di valutazioni e un quadro analitico per l'indagine di contenuti multimodali. Il modello è risultato uno strumento utile a determinare i livelli di competenza multimodale degli autori, la competenza nella manualità multi-digitale, la competenza nella progettazione multimodale e la competenza retorica. In più, l'analisi visuale di slide multimodali di studenti ha fornito una prospettiva qualitativa sui punti di forza e di debolezza delle alfabetizzazioni multiple. I risultati supportano l'uso del modello 4ML nei corsi di comunicazione aziendale e professionale, per migliorare le competenze digitali multimodali.

Parole chiave: COMUNICAZIONE MULTIMODALE, ALFABETIZZAZIONI MULTIPLE, ALFABETIZZAZIONE MULTIMODALE, ALFABETIZZAZIONE DIGITALE

1. Introduction

A digitally literate workforce is essential in a business environment characterized by technological disruption (Weritz, 2022). As new communication technologies rapidly disrupt the digital workplace, organizations must hire competent employees and develop their current workforce. To meet these demands, corporations must identify skills gaps within their human capital to upskill or reskill employees. The business communication environment is both digital and multimodal (Dias et al., 1999), necessitating an understanding of digital multimodal communication and related literacies for those training the future workforce. Despite ongoing discussions in academic and professional literature about closing the skills gap (Brent, 2011; Coffelt, et al., 2019; Winiarski, 2023), gaps remain, particularly in visual communication. Employers often categorize visual communication as either nonverbal communication or data visualizations (Coffelt et al., 2019), highlighting the need for shared terminology in multiliteracies and multimodal communication when training professional communicators.

Professional communication has evolved, making monomodal communication rare. Common workplace artifacts now combine text with images, icons, charts, shapes, color, layout, audio, and hyperlinks to enhance meaning and support accessibility. Slide decks, created in software like PowerPoint, Keynote, and Google Slides, are ubiquitous in the workplace and are inherently multimodal (Serafini, 2014). Twenty-first-century business communication is characterized by multimodal ensembles such as slide decks, data visualizations, social media posts, and email marketing.

Although slide decks are widely used, their effectiveness has been questioned, with issues like "death by PowerPoint" (Tufte, 2003) and poor use of presentation software causing excessive cognitive load (Knafllic, 2015). Professional communicators need multiple literacies, including visual and multimodal communication, to navigate the digital multimodal landscape effectively. The new "visual economy" (Canva, 2024) dominated by digital multimodal ensembles has transformed workplace communication, with consumers expecting engaging and visually rich messaging.

To address the workplace gap, business communication programs in higher education must train students to be multimodally literate communicators in digital spaces. A common approach is to require students to create and present multimodal slide decks for summative projects. However, evaluating multimodal literacy and assessing multimodal communication ensembles remains challenging. Instructors need to understand what it means to be multimodally literate to train their students effectively.

The purpose of this research is to examine how the four meta-literacies (4ML) model can be used to evaluate students' digital multimodal communication literacy, addressing both the workplace communication gap and the multimodal communication assessment gap in the literature. This multiple case study used the 4ML model to evaluate student slides created at the beginning and end of the semester, following explicit instruction in digital multimodal communication.

2. Literature review

2.1. Digital multimodal communication

Dias et al. (1999) argued that modern business communication is characterized by multimodality. Daily workplace communication is digitally crafted using combinations of modes that together make new meaning. Ubiquitous communication artifacts like email and slide decks include multiple modes in one communication piece. Examples of common modes incorporated into decking and emails include color, layout, text, shapes, sound, icons, and images. Not only does digital multimodal communication provide deeper, richer meaning than monomodal communication, it can reach a more diverse audience because it does not rely exclusively on textual language to communicate.

2.2. Multimodal literacy assessment

Multimodal literacy is rooted in the work of the New London Group (Cazden et al., 1996) who called for new pedagogies that incorporate multiliteracies to prepare learners for communication in a new digital landscape. Multimodality was coined by Kress (Kress, 2010; Lauer, 2009) to describe the communication phenomenon of multiple modes combining to create new meaning. Old mono-communication forms were being disrupted by innovative technologies which made it easier to combine textual and visual communication into a single message through digital technologies. With the advent of the World Wide Web, visual communication was no longer an afterthought or decorative add-on when constructing messages. Effective content creators

were those who could integrate visual information with textual information to craft rich multimodal messages that could be decoded with ease and added depth of meaning.

Professional and business communication scholarship has recognized the need to train communicators to be multimodally literate (Andrews, 2022; Bourelle et al., 2017; Brumberger, 2007; Coffelt et al., 2022; Lauer, 2009). As noted, closing the gap studies in workplace communication have shown multimodal literacy to be lacking. Coffelt et al. (2019) suggested the training “devoted to writing, speaking, and visualizing” should be “foregrounded in multimodal communication” (p. 434).

The terms *multimodality* and *multimodal literacy* have created challenges for scholars and instructors in higher education. Reid et al. (2016) encountered challenges in a cross-disciplinary study on faculty use of the term multimodality in their pedagogy. Although multimodality was the more correct term, they chose to use *multimedia* instead because it would be “most familiar and meaningful to those outside” composition and communication scholarship (p. 6). By not explicitly using multimodal terminology when describing the communication phenomena, a “shared vocabulary” will be difficult to achieve (p. 17). Bourelle et al. (2017) called for the infusion of multimodal pedagogies into online courses to train students in skills that will “serve students in the workplace long after the class has ended” (p. 82). The authors emphasize the explicit use of multimodal terminology, definitions, and practices to enable learners to be multiliterate communicators. For “without the explicit emphasis on multimodal literacy, students fail to see the connection between what they are being asked to do and what they are expected to learn” (p. 83).

As indicated, digital multimodal communication is a skill that needs to be taught and a concept that needs to be explicitly discussed in business communication classrooms. To reach that objective, alternative assessment approaches need to be implemented that are more suited to multiliteracies pedagogy and multimodal literacy. A theory-based multimodal design rubric was posited by Hung et al. (2013) for formative assessments of slide decks in a higher education setting. The five dimensions directly corresponded to the literacies put forth by the New London Group (Cazden et al., 1996). The rubric was created for “practical application” of multiliteracies and multimodal theory (p. 4). According to the authors, their rubric design allows users to adapt the rubric to their own purposes by adding to the criteria. In their action research study, Hung et al. used the rubric to assess slide deck presentations created by university students. Over the 18-week course, student slide deck presentations were assessed three times. Students were split into two groups for the study: a control and an exploratory group. The first assessment using the theory-based rubric was a formative assessment that served as a baseline for the study. Following the baseline assessment, the learners received instruction in multimodality and delivered a second presentation. All students met with their instructor to receive oral feedback on their oral performances, but only the exploratory group were introduced to the multimodal rubric and received explicit feedback based on it. The final presentation was scored again using the same rubric. The summative assessment was used by researchers to make comparisons across the three presentations. Compared to the control group, the exploratory group performed better across the five dimensions of the rubric following revisions of their slide decks. Both groups noted, in a learning perception survey, the effectiveness of the formative assessment to support their learning process in multimodal content creation.

2.3. Research gap

The present study addressed multimodal assessment gaps in the literature. Hung et al. (2013) expressed the “urgent need” for alternative assessment devices to support student digital multimodal literacy development and attainment (p. 409). The need for multimodal evaluation tools was also expressed by Tan et al. (2020) who argued for assessment tools to measure “students’ multimodal literacies” (p. 107). The next section will provide background for the 4ML model.

3. Theoretical background of the 4ML model

The 4ML model for digital multimodal communication (Strong, 2022) was constructed in response to the complex and swiftly evolving communication environment in modern workplaces (Ross et al., 2020; Sparks et al., 2016). Workplace communication demands have evolved and continue to evolve as new technologies disrupt traditional communication norms and practices. Digital transformation requires that employees possess the ability to multimodally express ideas across multiple channel choices (McGrail et al., 2021). To address this need, higher education courses must be equipped with digital multimodal pedagogies to train students to be effective communicators in the workplace. Multimodality and multiliteracies are difficult concepts that have been criticized by educators as being too theoretical to have any practical classroom use

(Cloonan, 2011). The 4ML model addresses the need for an approachable model in digital multimodal communication that has practical pedagogical value in business communication classrooms. It addresses terminology troubles that plague multimodality and multiliteracies (Tseronis & Forceville, 2017).

3.1. Foundations of the 4ML model

Multimodality asserts that all communication is constructed of multiple semiotic modes that harmoniously combine to create meaning (Kress, 2010). Additionally, others have concluded that all digital text is multimodal in nature (Tan et al., 2015). Rooted in the semiotic tradition and multimodality, the 4ML model is underpinned by the early work of Saussure and Peirce (Deely & Semetsky, 2017; Rose, 2007). Other theorists like Barthes (1967), Halliday (1978), and Kress (2010) contributed to the evolution of social semiotics and multimodal theory. In 1994, the New London Group met to discuss the need for new pedagogies to address the new digital landscape (Cazden et al., 1996). As witnesses to a remarkable period of digital disruption, the group of ten scholars envisioned a new worker who possessed multiple literacies to effectively communicate across digital multimodal spaces. To say their seminal work on multiliteracies and multimodality has been influential is an understatement. Scholars from a variety of traditions and disciplines have noted how important multiliteracy development is (Liang & Lim, 2021). Since the late 20th century, multiliteracies and multimodality have become intertwined and synonymous (Lauer, 2009). In the 4ML model, multiliteracies and multimodality are used interchangeably (Strong, 2022).

Strong (2022) previously discussed the digital workplace skills gap. Digital multimodal communication skills are essential in the workplace (Lodewick, 2022). According to experts, a digital workplace gap exists with nearly 75% of workers lacking the digital multimodal skills demanded (Conklin, 2022). Employees lack multimodal communication competencies in areas such as digital content creation, content design, and data visualization creation (Solis, 2022). Slide decks made in presentation software like PowerPoint and Google Slides are ubiquitous in the workplace (Knight, 2015). The digital communication technology requires composers to select and combine multiple semiotic modes for meaning making. Despite prioritizing slide decks as multimodal content creation projects to train professional communicators for digital workplaces (Brumberger, 2005), bad slide decks persist.

3.2. Development of the 4ML model

Strong (2022) used qualitative interpretive meta-synthesis (QIMS) to construct the 4ML model for digital multimodal communication. Originally developed for social work research, QIMS is a structured approach for handling a large body of diverse literature to achieve a synergistic understanding, or “web of knowledge,” of the phenomenon (Aguirre & Bolton, 2014, p. 283). The interpretive methodology results in a broader understanding of the topic and is used to “develop theory and to inform practice” (p. 279). Researchers employing this method are encouraged to “cast a broad net” when collecting the body of literature for the study (p. 284). The characteristic wide net includes books, grey literature, and studies from multiple disciplines. QIMS is an interpretive rather than an aggregate approach found in meta-analysis types of methods (Leary & Walker, 2018). The iterative rather than linear nature of QIMS allows the researcher to gain a comprehensive knowledge of the phenomenon while following cross disciplinary trails in the literature.

Using QIMS, a number of frameworks were examined using keyword searches and the New London Group’s (Cazden et al., 1996) article as foundation (Strong, 2022). Close readings and memo taking of frameworks and taxonomies allowed for comparisons and connections—both explicit and implicit. A chronology of nine frameworks were chosen for the data corpus and included in the analytical template (Cazden et al., 1996; Cook, 2002; Eshet-Alkalai, 2004; Feerrar, 2019; Gallagher, 2020; McGrail et al., 2021; Ng, 2012; Selber, 2004; Sindoni et al., 2022). Themes were extracted from each framework which were used for category construction in a process which was both inductive and deductive. The categories subsequently became the meta-literacies dimensions—digital literacy, multimedia skill literacy, multimodal design literacy, and rhetorical literacy. Concurrently, definitional literature was collected in a separate QIMS analysis involving keyword searches (*digital literacy, multimedia literacy, multiliteracies, multimodal literacy, multimodality, rhetorical literacy*) and following the threads to find the original definitions for the four meta-literacies. The broad net unearthed related literacies such as *computer literacy, data literacy, information literacy, media literacy, rhetorical literacy, silicon literacy, and visual literacy*. An analytical table was used to extract the themes and construct the definitions for the four meta-literacies.

3.3. Construction of the 4ML model

The former comprehensive study of multiliteracies and multimodality resulted in the 4ML model for digital multimodal communication (Strong, 2022). In multimodality and multiliteracies, shared terminology and definitions are key to having a shared understanding. Lauer (2009) makes a strong case for the importance of naming and having a shared language in multimodality and multiliteracies. The term *meta-literacy* was coined to describe the four dimensions or “definitional buckets” in digital multimodal communication (Strong, 2022, p. 57). The term is closely related to *metaliteracy*--a term used in library science (Mackey & Jacobson, 2011). Metaliteracy, in information science, carries the idea that the learner has a growing awareness of their own multiple literacies and how each literacy functions (Senapatiratne, 2021). This meta-awareness helps them in their development of needed skills and competencies. The use of meta-literacies in the 4ML model is informed by these ideals.

The four dimensions for the 4ML model for digital multimodal communication are digital literacy, multimedia literacy, multimodal design literacy, and rhetorical literacy (Strong, 2022). The sections that follow will provide definitions and key information about each meta-literacy.

3.3.1. Digital literacy

Digital literacy is defined in the 4ML model as the “ability to locate and critically evaluate information in multiple modalities found on a variety of digital spaces, and to demonstrate respectful and responsible use of information and intellectual property in digital multimodal communication” (Strong, 2022, p. 170). Simply put, digital communication is the respectful and responsible use of information and intellectual property (e.g. information, images, brand logos, charts, data). This complements one of the early definitions of digital literacy from Paul Gilster who wrote the 1997 book *Digital Literacy*. He wrote that digital literacy is “the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers” (p. 1).

Gilster’s (1997) definition has been widely circulated since that time and informed both Feerrar (2019) and Eshet-Alkakai’s (2004) digital literacy frameworks. Interestingly, Eshet-Alkakai’s digital literacy framework is a “top 10” digital literacy framework with over 655 citations for the work (Pangrazio et al., 2020, p. 447). Although the term has been muddied (see Lauer, 2009; Secker, 2018; Tseronis & Forceville, 2017), the central concept of respectful and responsible use of information has been included in digital and multimodal frameworks since the 1990s. Categories extracted from a chronology of meta-literacies and multiliteracies frameworks to construct the 4ML model (Strong, 2022) that encapsulate digital literacy concepts are ethical literacy (Cook, 2002; Feerrar, 2019; Gallagher, 2020), information literacy (Eshet-Alkakai, 2004; Ng, 2012), functional literacy (Selber, 2004), online etiquette literacy (Ng, 2012), and originality (McGrail et al., 2021; Sindoni et al., 2022).

3.3.2. Multimedia skill literacy

In the 4ML model, Strong (2022) defined multimedia skill literacy as the “technical skills and competencies needed to create, curate, and distribute using digital multimodal communication technologies” (p. 170). Multimedia was a term that Kress (2010) took exception to. He argued that its use created confusion between “past practices” and “present givens” (p. 30). Kress did offer an important distinction between multimedia and multimodality. Kress perceived multimedia as “cultural technologies of dissemination” and multimodality as “cultural technologies of representation” (pp. 30-31). Lauer (2009) created clear boundaries between multimedia and multimodality describing multimedia as the production process (skill) and multimodality as the design process (design). Competency has early connections to literacy in digital spaces. In the late twentieth century, digital literacy was described as “core competencies” needed to survive the internet age (Gilster, 1997, pg. 28). The connection between competencies, or skills, and multiliteracies is a theme throughout the literature as theorists struggled with the balance between theory and technological skill. Literacies from other frameworks that informed digital literacy as a dimension of the 4ML model (Strong, 2022) are technical literacy (Cook, 2002; Ng, 2012), technological literacy (Gallagher, 2020), digital technologies (Sindoni et al., 2022), reproduction literacy (Eshet-Alkakai, 2004), and functional literacy (Selber, 2004).

3.3.3. Multimodal design literacy

Multimodal design literacy is described as the “ability to effectively communicate meaning through multiple modalities such as language, text, audio, visual, gestures, facial expression, design choices, color, animation, and other semiotic resources in digital multimodal communication environments” (Strong, 2022).

Multimedia and multimodality are often used as synonyms for each other to avoid confusion when addressing audiences outside academia. As multimedia is widely understood, some scholars have intentionally used the term over the more accurate term multimodality. Adding to the confusion, multimedia and multimodality are terms used interchangeably in multiliteracies and multimodal communication literature. For Ball (2012), the usage depends upon the audience. Students are more familiar with multimedia than they are with multimodality. Despite terminology debates in multimodality and multiliteracies, Reid et al. (2016) chose to use multimedia over multimodal for the survey instrument in their multimodal communication study because of audience familiarity with multimedia. In the multimodal and multiliteracies scholarship, mode has been commonly associated with design (Bourelle et al., 2017). Multimodal design literacy was constructed using QIMS methodology and is informed by the following literacy categories: photo-visual literacy (Eshet-Alkakai, 2004), multimodality (Ng, 2012), multimodal literacy (Gallagher, 2020), mode and meaning (McGrail et al., 2021), and multimodal orchestration (Sindoni et al., 2022).

3.3.4. Rhetorical literacy

In the 4ML model, Strong (2022) defined rhetorical literacy as possessing the “social, cultural, and emotional acumen needed to make appropriate rhetorical choices about communication including audience evaluation, purpose, and persuasive devices (ethos, pathos, logos) for digital multimodal communication” (p. 170). Simply put, it shows evidence of purposeful and audience-centric communication. As Kress (2010) explained, social semiotic multimodality “demands a rhetorical approach to communication” (p. 26). Rhetorical literacy is a common theme throughout multiliteracies literature. One of the earliest multiliteracies frameworks was constructed by Cook (2002). Cook postulated six literacies to inform 21st century technical writing because the historical frames that guided business communicators were no longer adequate. The existing frameworks did not “fully articulate the multiple literacies necessary” for workplace success (p. 8). Another early conceptual framework for multiliteracies was proposed by Selber (2004) in his book, *Multiliteracies for a Digital Age*. Selber’s model, “The Conceptual Landscape of Computer Multiliteracies Program,” included the following three categories: functional literacy, critical literacy, and rhetorical literacy. Bourelle et al. (2017) emphasized the importance of considering the audience and purpose in “any given rhetorical situation” including multimodal compositions in business and technical communication (p. 224). Rhetorical literacy is informed by other framework categories including rhetorical literacy (Cook, 2002; Gallagher, 2020; Selber 2004), social literacy (Cook, 2002), social-emotional literacy (Eshet-Alkakai, 2004), critical literacy (Selber, 2004), social-emotional dimension (Ng, 2012), socio-cultural literacy (Gallagher, 2020), audience (McGrail et al., 2021), and transversal skills (Sindoni et al., 2022).

3.4. Simplified Terminology

Strong (2022) recognized the need for simplified terminology to apply the four dimensions of the 4ML model to business communication. To provide practical application, the 4ML theoretical model postulated one-word descriptors for each dimension. For digital literacy, the prevailing theme was *responsibility* for information being used and communicated. For multimedia literacy, the theme was *skill* in creating and distributing digital multimodal communication. For multimodal communication, the theme was *design* knowledge for incorporating semiotic modes and design theories. For rhetorical literacy, the theme was *audience* indicating the need for audience and situational analysis. Although the one-word descriptors may be too narrow in scope, there remains a need for simplified language to bridge the theoretical to the practical. More work needs to be done to make the 4ML framework more approachable for business communication practitioners and trainers.

4. Methodology

This multiple case investigation tests the 4ML theoretical model as an assessment tool in a higher education classroom. The intent of the study is to respond to the following research questions using a mixed method approach: How can the four meta-literacies model be used to evaluate multimodal artifacts in a business communication classroom? How does a visual analysis of slide decks inform the four meta-literacies model?

4.1. Study design

As part of the mixed method study, a scoring rubric was used to evaluate student created slide decks from two semesters of a single undergraduate business communication course. A multimodal content analysis (Ledin & Machin, 2020; Serafini, 2022; Serafini & Reid, 2023) of the slide decks was conducted in order to construct themes. The multiple case study involved two stages of analysis: within-case and cross-case (Merriam, 1998). Case one, which examined multimodal slide deck ensembles from spring semester 2022, was completed first. Case two followed with an examination of slide decks from fall semester 2022. Once each case was completed, cross-case analysis was performed to examine patterns across the two cases (Yin, 2018).

In this inquiry, the two cases were separate semesters of the same business communication course (BCOM 308: Technology for Business Communication). The undergraduate class was an elective course offering for the business communication certificate at a midwestern university in the United States. While the certificate was housed in the Business Communication department within the College of Business, non-business students could add the certificate to their degree. Even so, most students in the class were business majors. Students were either juniors or seniors due to course prerequisites. Enrollment demographics varied by semester. In spring 2022, the course had 12 female-identifying and 8 male-identifying students. In fall 2022, enrollment included 9 female-identifying and 14 male-identifying students.

This study drew from existing data found in the Canvas learning management system archives. In both spring 2022 and fall 2022, undergraduate business students completed a personal audit slide deck presentation of their use of communication technologies. Following the initial project, students received explicit instruction in the 4ML model for digital multimodal communication. Their final course project was a personal pitch deck, much like a visual resume, to highlight their achievements, strengths, and skills. The course outline, learning objectives, syllabus, and major assignments remained consistent from spring semester 2022 to fall semester 2022. The same instructor and lecture slide decks were used for both semesters, ensuring consistency in instruction and content delivery. The course workflow can be seen in Figure 1.

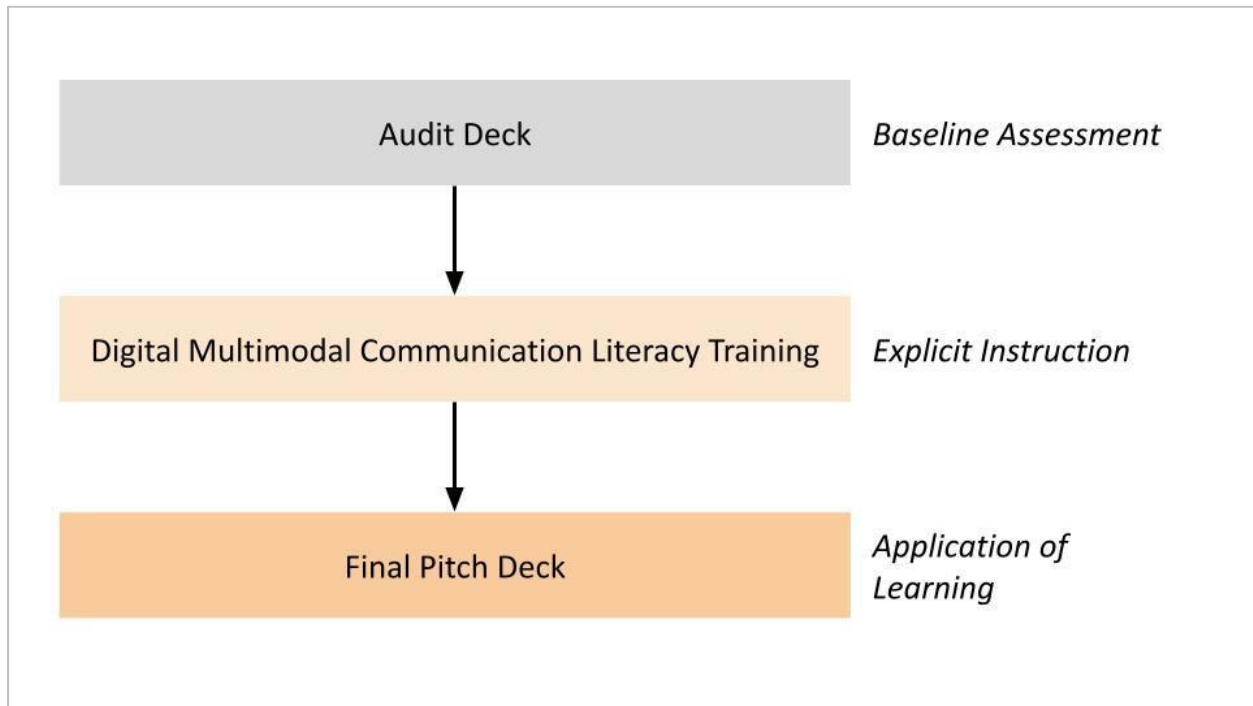


Figure 1. BCOM 308 course workflow

4.2. Data collection

Following approval by the university's Review Board, existent data was collected from two semesters of the BCOM 308: Technology for Business Communication course. Artifacts collected for the study included self-audit slide deck presentations and personal pitch deck presentations. All decks were completed in PowerPoint software. In spring 2022, all enrolled students created screencasts of their audit presentations and

shared the presentations via a discussion board on the Canvas learning management system. Because they used a variety of software to create the screencasts, only 17 out of the original 20 self-audit presentations were still available because the links had expired. All 20 pitch decks were still available for collection and analysis. For the fall 2022 semester, there were 23 students enrolled. One student did not complete the self-audit assignment, so only 22 slide decks were collected. Similarly, for the pitch deck, 22 slide decks were submitted.

4.3. Data analysis

Initial audit slide decks and end-of-the-semester pitch decks were evaluated for this study. The decks were rubric scored and comparisons were made in-case and cross-case. Multimodal content analysis was conducted on the slide decks to construct overall themes that inform the 4ML model.

4.3.1. Rubric scoring using 4ML

Rubrics are useful for evaluating literacy in higher education (Knight, 2006; Oakleaf, 2009;). The scoring framework offers an objective diagnostic tool to examine areas of strengths and areas for improvement guiding both instructors and students (Makani-Lim et al., 2014). Rubric design includes categories, indicators, and scoring strategy (Reddy & Andrade, 2010). The categories for the scoring rubric used in this study were the four meta-literacies taken from the 4ML model for digital multimodal communication—digital literacy, multimedia skill literacy, multimodal design literacy, and rhetorical literacy. Similar to Oakleaf (2009), the analytical rubric provided a score for each separate category. The scoring strategy incorporated a scale of 1-5 (Figure 2). The strategy was informed by Hung et al. (2013) who used a 5-point analytical rubric to assess multimodal composition in slide decks with (1) representing poor cohesion and (5) representing excellent cohesion to the design criteria. The scoring rubric was tested and refined before applying to the entire data corpus. Because slide decks are digital multimodal ensembles, each slide deck was evaluated as one unit.

4ML Scoring Rubric for Digital Multimodal Communication Ensembles						
	Definition	Mastery 5 points	Proficient 4 points	Developing 3 points	Emerging 2 points	Beginning 1 point
Digital Literacy	Demonstrates ethical and respectful use of content, Provides proper attribution, Avoids privacy issues, Shows respectful reuse content (e.g., follows brand style guides for aspect ratio and color)	Demonstrates complete mastery of the skills and competencies	Demonstrates considerable mastery of the skills and competencies	Demonstrates partial mastery of the skills and competencies. Most criteria are met.	Demonstrates limited mastery of the skills and competencies. Many criteria are not met.	Demonstrates no mastery of the skills and competencies.
Multimedia Skill	Avoids use of presets and defaults (templates, color schemes, fonts, layouts), Demonstrates advanced skills (transitions, animation), Shows ability to produce related artifacts (e.g., PDF, JPEG, PNG, screencast, notes), Knowledge regarding pixel size, checkered	Demonstrates complete mastery of the skills and competencies	Demonstrates considerable mastery of the skills and competencies	Demonstrates partial mastery of the skills and competencies. Most criteria are met.	Demonstrates limited mastery of the skills and competencies. Many criteria are not met.	Demonstrates no mastery of the skills and competencies.

	backgrounds show lack of knowledge re: file types					
Multimodal Design	Demonstrates consistent and intentional use of multiple modes (color, images, fonts, shapes, layout composition, movement to support message, Use of salience to focus message, Shows congruency between design and message, Demonstrates knowledge of gestalt principles, Shows creativity in design	Demonstrates complete mastery of the skills and competencies	Demonstrates considerable mastery of the skills and competencies	Demonstrates partial mastery of the skills and competencies. Most criteria are met.	Demonstrates limited mastery of the skills and competencies. Many criteria are not met.	Demonstrates no mastery of the skills and competencies.
Rhetorical Literacy	Appropriate for audience (i.e., accessibility, cognitive load), Creates for audience appeal not self-appeal, Purpose is evident, Shows logical flow of information and organization, Demonstrates credibility through professionalism (including grammar), Constructs a persuasive communication	Demonstrates complete mastery of the skills and competencies	Demonstrates considerable mastery of the skills and competencies	Demonstrates partial mastery of the skills and competencies. Most criteria are met.	Demonstrates limited mastery of the skills and competencies. Many criteria are not met.	Demonstrates no mastery of the skills and competencies.

Figure 2. Criteria for scoring

4.3.2. Multimodal content analysis

Multimodal content analysis (MMCA) is a systematic, interpretivist visual methodology underpinned by multimodality theories and qualitative content analysis (Serafini, 2022). Unlike quantitative content analysis approaches characterized by large data sets, MMCA studies tend to focus on “manageable data sets” that fall somewhere between 20 and 100 units of evaluation (Serafini, 2022, p. 79). Social semiotic multimodal researchers recognize that multimodal texts have multiple meaning-making potential as modes combine to create new meaning shaped by sociocultural influences. Slide decks, also referred to as presentation slides, are a widely used form of multimodal texts that require creators to “think visually and often multimodally” (Hung et al., 2013, p. 401). They are an example of “digital ensembles that utilize more than one mode to represent meaning potentials” (Serafini, 2022, p. 78). MMCA applies both inductive and deductive reasoning into its multiple-step process. The construction and utilization of an analytical framework is central to the

methodology. The analytical framework categories are developed inductively from the data corpus itself following close readings and theoretical memo taking, or deductively from categories developed in previous studies (Serafini, 2022). The analytical template will often go through multiple iterations as it is tested and refined and retested using samples from the data corpus.

Case:	Participant ID:	Assignment:						Notes
	Definition	5	4	3	2	1	0	
Digital Literacy	Demonstrates ethical and respectful use of content, Provides proper attribution, Avoids privacy issues, Shows respectful reuse content (e.g., follows brand style guides for aspect ratio and color)							
Multimedia Skill	Avoids use of presets and defaults (templates, color schemes, fonts, layouts), Demonstrates advanced skills (transitions, animation), Shows ability to produce related artifacts (e.g., PDF, JPEG, PNG, screencast, notes), Knowledge regarding pixel size, checkered backgrounds show lack of knowledge re: file types							
Multimodal Design	Demonstrates consistent and intentional use of multiple modes (color, images, fonts, shapes, layout composition, movement to support message, Use of salience to focus message, Shows congruency between design and message, Demonstrates knowledge of gestalt principles, Shows creativity in design							
Rhetorical Literacy	Appropriate for audience (i.e., accessibility, cognitive load), Creates for audience appeal not self-appeal, Purpose is evident, Shows logical flow of information and organization, Demonstrates credibility through professionalism (including grammar), Constructs a persuasive communication							
Additional notes:								

Figure 3. The Analytical Template

The visual analysis was conducted concurrently with the rubric scoring using the same analytical template (Figure 3). Memo taking and close reading, characteristics of multimodal content analysis (Serafini, 2022), were incorporated into the analysis phase. The rubric scoring form and the qualitative analytical template were combined into one analytical template due to the overlapping categories—digital literacy, multimedia skill literacy, multimodal design literacy, and rhetorical literacy. The analytical template with the scoring rubric was tested on five slide deck ensembles and improvements were made prior to applying it to the entire data corpus. Figure 4 illustrates the data analysis process.

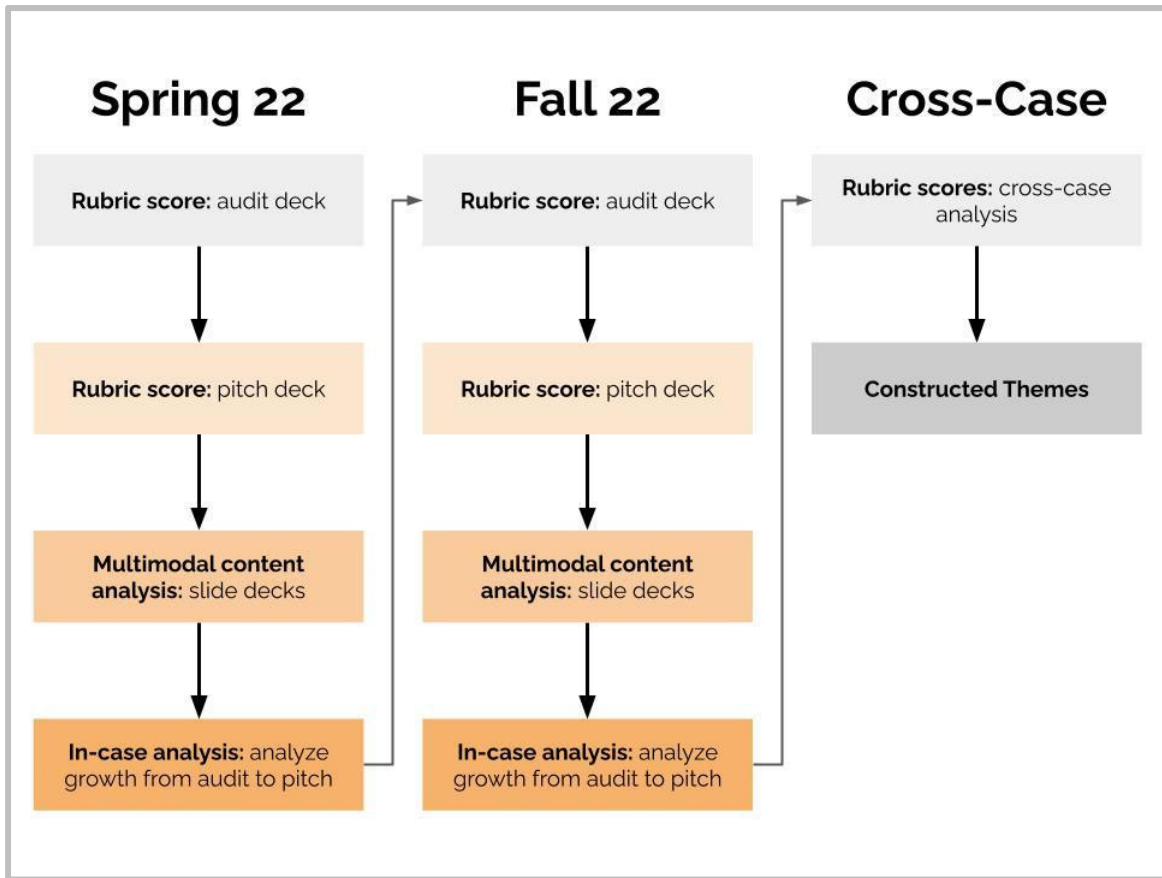


Figure 4. Data Analysis Process

5. Results

The mixed method inquiry allowed for the examination of the 4ML theoretical model as both a quantitative and qualitative analytical tool to gauge digital multimodal communication literacies levels in a business communication course. By examining slide deck ensembles from two separate cases, the goal was to test the tool and address the multimodal literacy assessment gap in the literature.

5.1. Rubric scoring results

The analytical rubric scoring results of the multiple case study are divided into three sections (1) Case one: spring 2022, (2) Case two: fall 2022, and (3) Cross-case results. The numerical results section addresses the research question: how can the 4ML model be used to evaluate multimodal artifacts in a business communication classroom?

Table 1
Average scores per meta-literacy

Dimension	Spring 22 audit	Spring 22 pitch	Fall 22 audit	Fall 22 pitch
Digital Literacy	1.35	2.75	1.41	2.95
Multimedia Skill	2.06	3.05	1.68	3.14
Multimodal Design	1.91	3.25	1.50	3.14
Rhetorical Literacy	2.12	3.43	1.91	3.50

5.1.1. Case one: Spring 2022

Slide decks were evaluated using the 4ML model as an analytical scoring rubric based on a five-point scale. Each of the meta-literacies—digital literacy, multimedia skill literacy, multimodal design literacy, and rhetorical literacy—was given a score. For analysis, each slide deck was considered a unit of analysis, and all the scores were averaged to create a composite score. For Spring 2022, the total number of slide deck ensembles that were evaluated was 37 including 17 audit decks and 20 personal pitch decks. Average scores are listed in Table 1.

For audit decks, the overall average scores ranked from lowest to highest is as follows: digital literacy (1.35), multimodal design literacy (1.91), multimedia skill literacy (2.06), and rhetorical literacy (2.12). Digital literacy scores indicate a need for targeted instruction in digital literacy in higher education. The higher average scores for rhetorical literacy suggest effective instruction in previous courses in the curriculum. Multimodal design literacy was lower than multimedia skill suggesting composers had more skill than design acumen.

Created following explicit instruction in the 4ML dimensions, the personal pitch decks ranked from lowest to highest as follows: digital literacy (2.75), multimedia skills literacy (3.05), multimodal design literacy (3.25), and rhetorical literacy (3.43). The ranking is similar to the initial audit decks with digital literacy having the lowest scores and rhetorical literacy the highest. Multimodal design literacy is higher in ranking for the pitch deck, which may suggest more targeted instruction in that area.

When comparing scores from the initial audit slide deck and the final pitch deck, the digital literacy dimension saw the most significant average growth at 104%. Multimodal design literacy had the next highest growth rate at 70%. Rhetorical literacy rates grew at 62%, and multimedia skill showed a 48% growth rate. Although slide deck scores show students began the semester with a low baseline rate of digital literacy, targeted instruction led to improvement in this area. Improvement in rhetorical literacy supports the conjecture that the curriculum provides a strong foundation as students effectively applied audience, purpose, and rhetorical appeals in different assignments and contexts. The overall growth supports the 4ML model as an effective tool for enabling multiliteracies growth.

5.1.2. Case two: Fall 2022

The sample size for fall 2022 was 22 audit slide decks and 22 personal pitch decks, totaling 44 decks. Using the analytical rubric based on the 4ML model, each deck was analyzed similarly to case one. The overall scores were averaged to evaluate both within the case and across cases.

For the initial audit deck, the average scores ranked from lowest to highest are digital literacy (1.41), multimodal design literacy (1.50), multimedia skill literacy (1.68), and rhetorical literacy (1.91). Digital literacy was the lowest, indicating a need for focused instruction in that dimension. Rhetorical literacy was the highest baseline literacy, suggesting students are receiving a solid foundation in other business communication courses.

For the final personal pitch decks, the average score ranking from lowest to highest are digital literacy (2.95), multimedia skill literacy and multimodal design literacy (3.14), and rhetorical literacy (3.50). Multimedia skill literacy and multimodal design literacy are consistently ranked in the middle, suggesting literacy layering (Cook, 2002) and interconnectedness (McGrail et al., 2021).

When analyzing the growth between the audit decks and the pitch decks, both digital literacy and multimodal design literacy had the highest percentage of growth at 109%. This was followed by multimedia skill literacy at 87% growth and rhetorical literacy at 83% growth. Substantial growth percentages suggest the efficacy of the 4ML model not only as a scoring device, but also as a framework for targeted instruction in digital multimodal communication dimensions.

5.1.3. Cross-case analysis results

To examine overall patterns and increase generalizability, a cross-case analysis was conducted (Merriam, 1998; Yin, 2018). The total number of slide deck ensembles that were scored with the analytical rubric was 81.

When comparing the average audit decks scores, digital literacy was the only literacy lower in spring 22 (1.35) than fall 22 (1.41). Otherwise, the other three literacies were higher in spring 22 than fall 22. Although the audit deck assignment had the same criteria, the delivery modality differed. With some COVID restrictions still in place, the spring 22 audit decks were presented as screencasts. Analysis of the slide decks was conducted using the screencasts available. In contrast, the fall 22 audit decks were presented face-to-face.

A cross-case comparison of pitch decks also shows overall literacy levels as lower in spring 22 than in fall 22 except for multimodal design literacy which was slightly higher in the spring (3.25) than in the fall (3.14). Although the multimodal design literacy level was lower in fall 22, the growth rate was 109% compared to a 70% growth rate in spring 22. The increased growth rate may indicate more focused instruction in that dimension for fall 22.

Overall, a clear ranking pattern emerged in cross-case results, with digital literacy ranking lowest and rhetorical literacy the highest on audit and pitch decks for both cases. The pattern suggests that multimodal composers may struggle with their digital literacy while performing better in rhetorical literacy. Despite having the lowest ranking, digital literacy had the highest cross-case growth rate (106.5%) followed by multimodal design literacy (89.5%). Although rhetorical literacy rates are ranked highest, slide deck average scores showed that this dimension had a 72.5% overall growth rate, suggesting students were building on prior knowledge. Although there is a clear pattern of ranking in the 4MLs, the relatively small sample size should be noted. It would be interesting to see if, in future studies, the ranking remains consistent.

5.2. Multimodal content analysis

The entire data corpus consisting of 81 slide deck ensembles was analyzed using multimodal content analysis (Serafini, 2022). The purpose of the qualitative inquiry was to satisfy the research question: How does a visual analysis of slide decks inform the four meta-literacies model? In multimodal content analysis, themes are constructed through a multiple coding process similar to grounded theory (Serafini & Reid, 2023; Strauss & Corbin, 1990). The six themes constructed from a visual analysis of multimodal slide deck ensembles follow.

5.2.1. The invisibility of digital literacy

A number of slide decks in the case study were curiously devoid of any secondary source material, a measure of digital literacy and responsibility. The multimodal composers chose not to include any photographs, stock images, brand icons, quotes, or other outside sources in their slide deck content and design. The resulting decks had a sterile and generic feel to the overall aesthetic, which consequently showed an overall lack of effort. At first glance, it did seem as though the scoring rubric category for digital literacy could account for this anomaly. The indicators for the digital literacy category examined use of citations, adherence to fair use and copyright guidelines, inclusion of a source slide, use of footnotes and/or in-text citation, respectful use of brand icons, data literacy, etc. The challenge with a five-point rubric was how to score the slide deck within the category when students showed no evidence. Lack of supporting evidence could be due to lack of effort, but it could also reveal a lack of knowledge and ability to respectfully use other's content. By not including outside source material to support their ideas and message, they actually revealed some of the lowest levels of digital literacy.

An example from fall 22 shows an audit deck with only four slides; a green monochromatic template is applied to it (see Figure 5). The template decoration is the same on every slide with thicker lines and more visual weight on the right side. Within the gradation of greens is a white open space reserved for the content creator to add their touch. The student creator added minimum text to the first slide. The agenda was added to the topic where the template layout would have it and four bullet points with no more than four words per bullet point. Overall, the agenda slide had 13 words and provided little information and even less visual interest. The next two slides with the same green decorating template included a screenshot image from the student's spreadsheet showing their audit data. The screenshots overlapped the template design background, and a few bullet points of information were included below the screenshot. The fourth and final slide included the conclusion title and one bullet point with a full sentence written in first person. The slide deck looked as if it had been created in less than ten minutes and lacked any outside information.

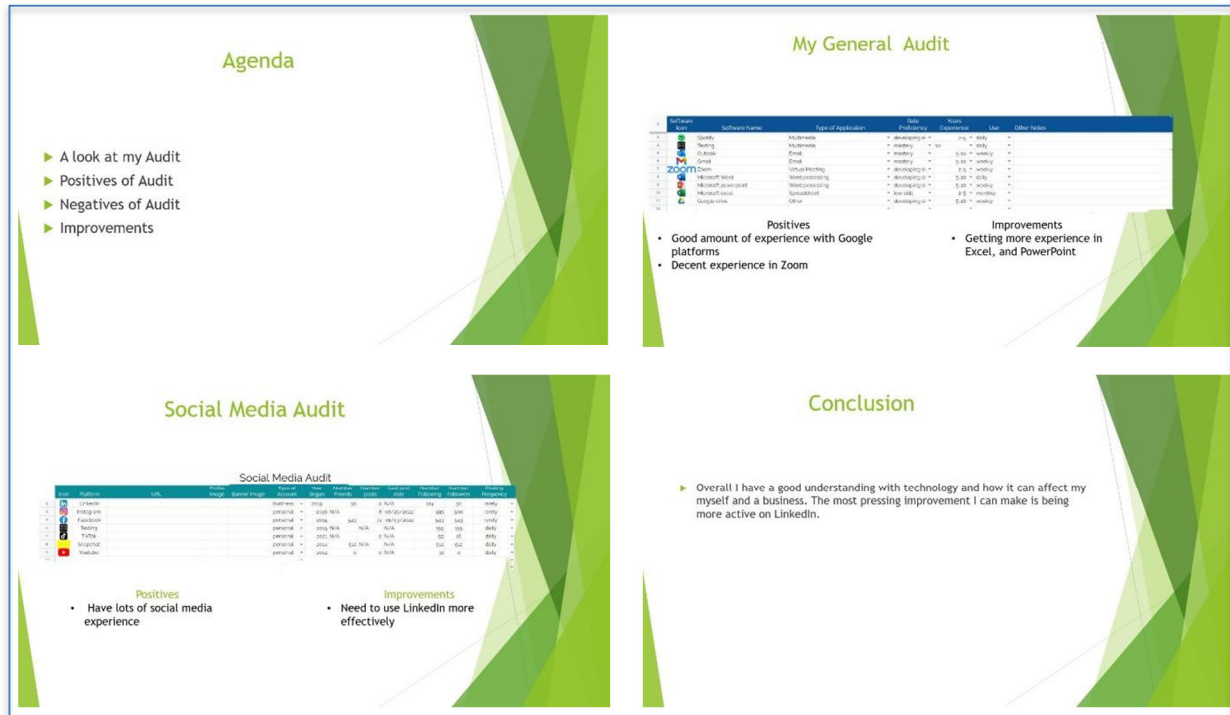


Figure 5. Green Template Slide Deck Screenshot

5.2.2. From decor to design: Moving creators to higher literacy levels

The old design adage, form follows function, is as relevant to the digital age as it was before. Digital multimodal communicators with lower levels of literacies miss the important distinction between designing and decorating. Composers choose to decorate their slides to make them appealing to their audience—or more often, to themselves—rather than using design elements to support the message. When presenters choose to decorate rather than design, the decorative elements add no communicative value or at times may detract from the message. With too much visual information, audiences may experience cognitive overload (Mayer & Moreno, 2003) which causes them to disengage from the presentation. One way multimodal composers decorate their presentations rather than design their presentation is by selecting a slide pre-set theme. Instead of making multimodal design decisions that add to meaning making, slide deck creators defer those key visual communication choices to a designer who created a good-looking deck for that generic purpose alone. As slide deck creators move away from template use, they avoid hidden biases that audiences may bring from another presentation that uses the same slide deck template.

Another example is seen in Figure 6 which was taken from fall 22 data. The audit deck is created from a popular template found on Slides Carnival, a website that provides free templates for Google Sheets, PowerPoint, and Canva (Slides Carnival, 2024). The undergraduate student applied the *Creative Pitch Deck* template from this site to their entire deck. Some of the keywords attributed to this particular template are creative, informational, multipurpose, project presentation, and SWOT analysis. The template incorporates light colored, sketchy drawings of objects from a bird's eye view of one's desk. On the bottom of the slide is a laptop with ear buds, to the left is a cup for coffee or tea, and on the top right is a tablet. Other smaller items like pens, a calculator, headphones, and a notebook are all radiating out from the center. The background is a mid-tone grey and the title text color is a tomato red. The body text is black and the bullet points are also tomato red. The text is layered over the sketchy decorative drawings on the background of the slide. The overlap creates unnecessary visual noise and makes decoding of the text a bit more challenging.

BUSINESS TECHNOLOGY EXPERIENCE

Presentation

- Prezi
- Google Slides
- Microsoft Powerpoint

Graphic Design

- Photoshop
- Google Drawings

CONTINUED

Spreadsheets

- Microsoft Excel
 - 5 years experience
- Google Sheets
 - 10+ years experience

Email

- Microsoft Outlook
Mitchenm5393@uwc.edu
- Gmail
mitchellnick4444@gmail.com

Meetings

- Microsoft Teams
- Zoom
- Discord
- 5 years experience

CONTINUED

Video Editing

- Sony Vegas
- Final Cut Pro

Word Processing

- Google Docs
- Microsoft Word

Management

- Google Drive

SOCIAL MEDIA

How active and large is my social media usage?

SOCIAL ACCOUNTS

<p>FaceBook</p> <p>I have had a FaceBook Account for about 5 years.</p> <p>I do not have access to it and it is not publicly available.</p> <p>Need to regain access to account.</p>	<p>SnapChat</p> <p>Snapchat user for upwards of 8 years.</p> <p>Active semi frequently, more active when being contacted.</p>	<p>LinkedIn</p> <p>Account activated in 2015.</p> <p>Very inactive on it, very small presence.</p> <p>Need to be more active.</p>
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Figure 6. Popular Template from Slide Carnival

5.2.3. Contrasting competencies: The duality of multimodal communication choices

The use of templates by multimodal creators often signals lower levels of multimedia skills literacy. Rather than learning the tools to create effective multimodal ensembles, some students will use templates. The use of a template does not hide skill deficit well but can easily expose low literacy levels. Once creators who lack software knowledge apply their chosen template to the slide deck, they find themselves constrained by it because they don't have the skill to make the changes. Orphaned text boxes—text boxes that have been created but have no textual information inside—are one indicator that the multimodal composer lacks understanding of layout features and slide construction.

The interesting phenomenon that came from this multimodal content analysis was that a choice that reveals a lack of literacy in one meta-literacy might raise the literacy level in another. The template is a good example of this. Although template use exposes lack of multimedia competency, it raises multimodal design ratings because the template layout is designed with clear hierarchy.

An audit slide deck example from fall 22 shows a common slide deck template with a navy background and teal colored overlapping triangle with a slight shadow (see Figure 7). The bottom right hand triangles are larger to provide visual weight to the bottom of the slide deck, while smaller triangles are on the top opposite corner. The layered triangles give the impression of layers of paper that are strewn across a workspace when one is busily working on a project. The undergraduate student has added text and two brand icon images to the slide. The brand icon images include a white background indicative of a jpeg image file rather than a png file, which is characterized by a transparent background. Although the white background adds visual noise, the icons are viewable, whereas if they had a transparent background they would get lost in hue. The white text on the dark blue background provides high contrast, so the information is readable to the audience. Although the template is a poor multimodal design choice because the triangles create visual noise and distract, rather than support, the overall message, the template layout does provide clear hierarchy with the title font size being the salient information on the slide.



Figure 7. Navy Template with Triangles

5.2.4. *The interplay of literacies: The influence of multimodal decisions across the framework*

As noted by Strong (2022) and others (Cook, 2002; Feerrar, 2019; Gallagher, 2020; McGrail et al., 2021), multimodal literacies are interconnected. Also described as synergistic layering, the concept of overlapping of literacies originated with Cook (2002). In multimodal communication, a slide deck composer might decide to use a childish, cartoon character on one of their slides for a formal, business professional presentation. The design choice is a poor one when other slides in the slide deck include high quality photographs. The incongruent slide deck design scheme indicates lower multimodal design literacy. This carries over to rhetorical literacy as audiences might perceive the creator as having lower credibility because of their poor design choice.

An example of the interplay of multimodal choices is provided from a spring 22 audit deck screencast (see Figure 8). The multimodal composer chose a black and white color scheme to show professionalism and formality much like wearing a black and white tuxedo ensemble semiotically communicates a formal occasion. The slide backgrounds were white and had a high contrast with the black banners and white text. For the slide deck, the undergraduate business student included images that were predominantly grey-scale with cool colors to support the overall feeling of formality. The slide composition was formal in arrangement with images and shapes in symmetrical balance. The uniform design and effective use of multimodal elements shows a higher level of multimodal design literacy. A screenshot taken of the screencast recording shows the slide deck prominently behind a small thumbnail image of the presenter in the lower right-hand corner. The presenter is casually attired wearing a Carhartt stocking hat in stark contrast to the formal and professional slide deck they are presenting.



Figure 8. Formal Slide with Informal Delivery

5.2.5. *Lost in hue and other poor saliency issues*

In multimodal design, saliency plays an important role. By employing color and contrast techniques along with design principles, the multimodal composer is able to focus their audience's attention and to communicate hierarchy (Serafini, 2014). Saliency is a way to visually express significance to audiences (Kress, 2010). It reduces eye movement and improves decoding of information. When a multimodal slide deck lacks saliency because of poor design choices, viewers may become confused and disengaged.

Two examples from the case study show how poor saliency in digital multimodal communication reveals students' levels of multimodal design literacy. Example one is taken from spring 22 (See Figure 9). The personal pitch deck slide has a saturated teal background. Featured prominently on the slide is a horizontal bar chart with spearmint green bars which are barely discernable against the teal. The textual elements on the slide are white which creates a high contrast with the saturated background hue. The analogous color scheme was ineffective because the salient information from the graph was lost to the viewer.



Figure 9. Bar Chart Elements are Difficult to See

Example two is a fall 22 audit deck with a different type of salience issue (see Figure 10). The slide is cluttered with visual information and the viewer is uncertain where to focus. On this slide, the background is also a saturated hue with a contrasting white title. The high contrast between the white text and the blueberry background uses saliency to create hierarchy, but the overall message is lost in the messiness of the slide. Against the blue background, there are 18 different brand logos related to communication technology that, at first glance, seem to be scattered around the slide in a haphazard manner. After viewing the slide for a moment, it is possible to discern two possible categories of logos, as some white space roughly separates the groupings. The most salient logos are the Snapchat social media logo and the Google Slides logo. Both logos are yellow hues which are complementary to the background. In visual weight, the TikTok logo fights for attention because of its black background. The red and pink logos like Instagram, Canvas, and PowerPoint scattered about the screen cause more eye movement.

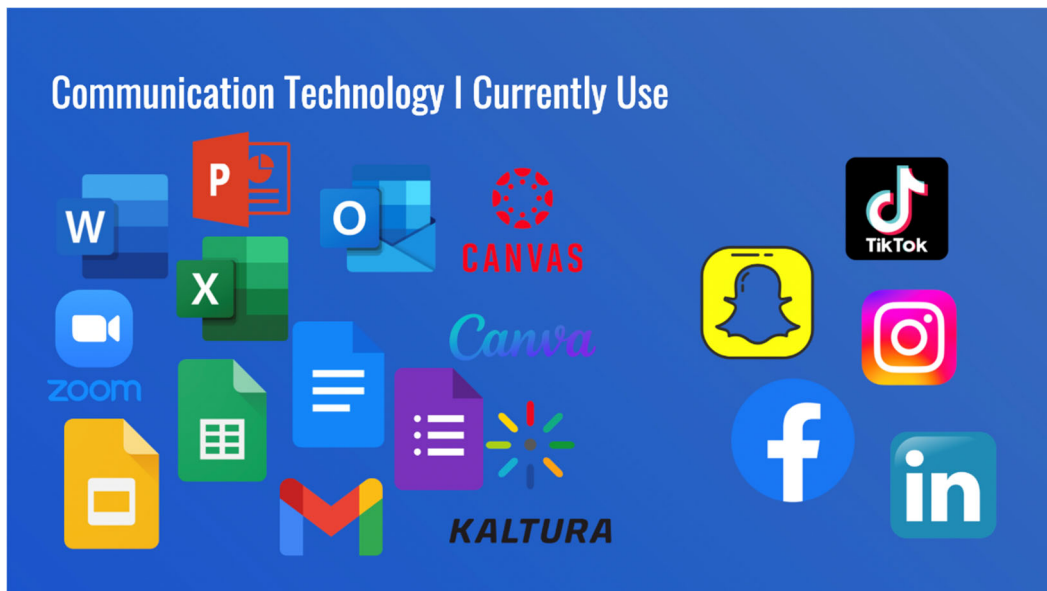


Figure 10. Multiple Icons on Bright Blue Slide Background

5.2.6. Errors and ethos: The impact of basic literacy on rhetorical intentions

In the 4ML model (Strong, 2022), basic literacy was posited to be foundational to the theoretical model rather than a sub-category. Through a multimodal content analysis of student slide decks, it became apparent that student work riddled with spelling, punctuation, grammar, and capitalization errors have a direct impact on the perceived credibility of the multimodal composer.

An example of this can be taken from the pitch deck assignment, where undergraduate business majors were asked to compose a multimodal slide deck as a visual resume. In persuading a potential employer, the slide deck creator chose to highlight some of their high school and college achievements. On the high school accomplishment slide, there are four bullet points (see Figure 11). The first bullet point includes the high school name with obvious capitalization errors. The next bullet point proudly proclaims the mascot for the school. The third bullet point signals completion of advanced placement courses that have the potential of college credit if students score high enough. The final bullet point cites receipt of high academic honors with the adjective written out of sequence. Excluding bullet point two, which has no rhetorical value, the juxtaposition of claims to high academic achievement against obvious basic grammar mistakes leads one to question the student's credibility. The purpose of the next slide in the same deck is to highlight academic achievements at the university level (see Figure 12). The visual support on the slide is an image of the university seal that includes the word *Excellence* prominently displayed. The idea of excellence sharply contrasts with the textual information that includes an apostrophe error.



Figure 11. High School Accomplishments for Visual Resume

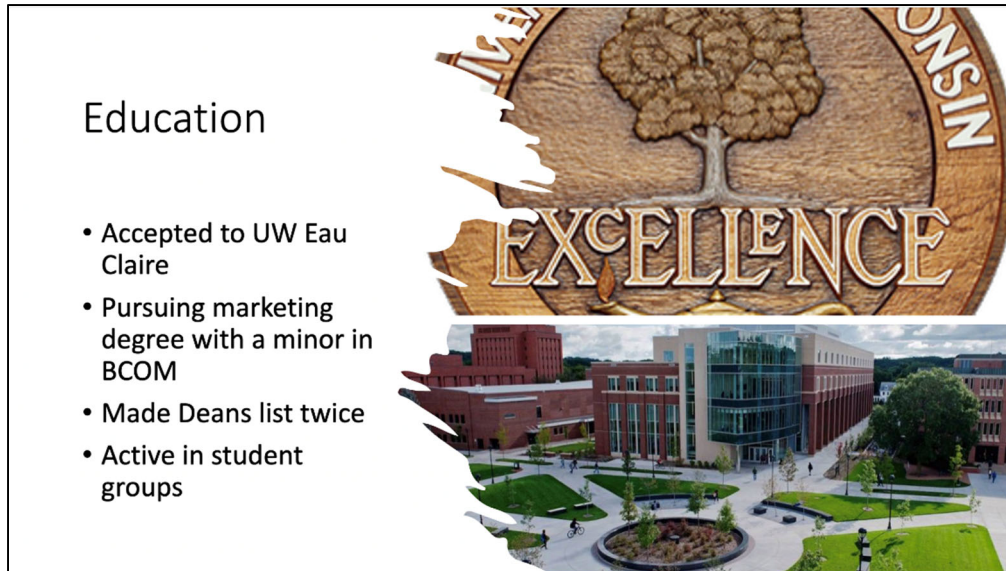


Figure 12. University Accomplishment Slide

6. Discussion

6.1. Interpretation of results

When considering the results of the current mixed-methods study, it is important to recall the central purpose, which was to test the 4ML model in digital multimodal communication as an assessment tool. The theoretical model was the foundation for the analytical scoring rubric and the analytical template for multimodal content analysis. From this lens, key findings will be discussed.

The key finding is that overall the 4ML was an effective tool for evaluating digital multimodal communication artifacts to determine the literacy levels of composers across four dimensions. The case study examined the intervention of explicit instruction in the 4ML model and measured growth from the audit deck baseline to the personal pitch deck final project. By consistently applying a standardized rubric, the result was measured growth in all four meta-literacies. The intervention of explicit instruction in digital literacy, multimedia skill literacy, multimodal design literacy, and rhetorical literacy was intended to “develop learners’ meta-semiotic awareness and metalanguage of multimodal texts” (Tan et al., 2020, p. 110).

In terms of overall growth, undergraduate multimodal composers had the most significant growth in their digital literacy, most notably in fall 22. This supports the argument for explicit instruction in digital literacy skills, which includes information literacy in the 4ML model (Strong, 2022) for business students (Makani-Lim et al, 2014). Multimodal design literacy was another dimension where growth was measured.

Multimodal composers scored highest in rhetorical literacy in both slide deck projects for both semesters. A rhetorical approach to business communication is emphasized across the program, so undergraduate students at this particular university would bring in that prior knowledge. As it relates to the 4ML model, Strong (2022) postulated the synergistic nature of the meta-literacies dimensions which support earlier research noting that literacies are layered (Cook, 2002), interconnected (Feerrar, 2019; Lauer, 2009; McGrail et al., 2021), and overlapping (Ng, 2012). Although meta-literacies overlap, clear multiliteracies boundaries must be created for there to be an effective evaluation of multimodal communication.

A surprising finding was the consistency of ranking for the literacies across the multimodal slide deck projects and cross case. Rubric scores showed digital literacy as the lowest, while rhetorical literacy was the highest. The initial decks for both spring 22 and fall 22 ranked multimodal design as the second - lowest dimension. Spring 22 pitch decks showed multimedia skill as the second lowest, while the fall 22 pitch decks had both multimodal design and multimedia skill ranked equally the second lowest. The ranking supports calls for more multimodality in the professional communication curriculum (Coffelt et al., 2022) and for multimodal communication evaluation tools (Hung et al., 2013). It also supports the argument that students should be explicitly taught multimodal terminology (Tan et al., 2020) in order to have a shared understanding (Lauer, 2009).

6.2. Implications

The theoretical implications of the present study support the use of the 4ML model in digital multimodal communication as both a quantitative and qualitative assessment tool. The efficacy of the model as a rubric scoring tool to diagnose multimodal creators' literacy in a business communication course has been shown. Each of the four meta-literacies were also used as categories in an analytical framework for multimodal content analysis. The multimodal analysis resulted in themes that provided qualitative information about how slide deck multimodal construction and decision-making reveals literacy strengths and gaps.

Practical and pedagogical implications from the mixed-methods inquiry indicate that educators who wish to understand their students' digital multimodal communication literacies can use the 4ML model in formative evaluations for diagnostic purposes. The information could be used for targeted instruction to improve learning outcomes.

The 4ML model could also be used at the curricular level to plan curriculum and instruction that supports digital multimodal communication literacy development. Additionally, it can be used as a guide for examining existing curriculum for multiliteracies gaps. Business colleges should consider leveraging other resources like the university library services to help create digital and information literacy instruction (Makani-Lim et al, 2014).

6.3. Limitations

As with all studies, there are limitations. The study was limited by the sample size, which was within bounds for the qualitative multimodal analysis, but low for quantitative inquiry. The study looked at only multimodal slide deck compositions from the beginning of the semester and from the end of the semester, but did not examine other multimodal artifacts created in the course, so it may not fully represent student work. Not all student slide decks were available because this was a past course and links had expired. Although assignments were the same in both cases, consistency in explicit instruction may have varied semester over semester.

Another limitation was that the study was conducted by a single researcher. The study design included a standardized analytical tool for consistency in analysis, multiple cases to allow for cross-case examination, and a mixed-method approach for triangulation. Despite these efforts, researcher bias should always be factored.

6.4. Future research

Future research is needed to explore the 4ML model as a multimodal assessment tool in other contexts and with larger sample sizes. The current study was narrowly focused on slide decks as a multimodal communication ensemble. Other multimodal artifacts should be explored including data visualizations, social media posts, multimodal presentations, and other digital content.

An intriguing direction is to explore different generative AI tools as a multimodal composer to determine meta-literacies strengths and gaps. This could provide valuable information about how multimodal content creators approach their use of the tool and what interventions should be made when using generative AI to support multimodal communication construction.

7. Conclusion

The mixed method study began with an overview of the digital workplace gap highlighting the need for more multimodality in business and professional communication courses (Coffelt et al., 2022). With the need for more multimodal content in higher education classrooms comes the need for effective evaluation tools to evaluate students' multiliteracies and support their development of multimodal competencies (Hung et al., 2013; Tan et al., 2019). The 4ML theoretical model in digital multimodal communication provided the foundations for the quantitative and qualitative examinations of undergraduate students' multimodal communication ensembles. The scoring rubric for the 4ML model indicated a consistent ranking pattern in multimodal communication literacies. By employing a visual analysis of the decking, constructed themes provide more information about digital multimodal communication literacies in professional communication. Overall, the study demonstrated that the 4ML model is an effective evaluation, intervention, and visual analysis tool.

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Appendix A

Table S1
Rubric scoring for spring 22 audit decks

	Digital literacy	Multimedia skill	Multimodal design	Rhetorical literacy
1	4.0	4.0	3.0	2.0
2	1.0	2.0	1.0	2.0
3	3.0	2.0	2.0	2.0
4	1.0	2.0	2.0	2.0
5	1.0	1.0	2.0	2.0
6				
7	1.0	2.0	2.0	1.0
8				
9	1.0	1.0	1.0	1.0
10	2.0	4.0	2.0	2.0
11	1.0	2.0	3.0	3.0
12	1.0	1.0	1.0	1.0
13	1.0	2.0	2.0	3.0
14	1.0	2.0	2.5	3.0
15	1.0	1.0	1.0	1.0
16				
17	1.0	2.0	1.0	2.0
18	1.0	2.0	2.0	2.0
19	1.0	2.0	2.0	3.0
20	1.0	3.0	3.0	4.0

Appendix B

Table S2
Rubric scoring for spring 22 pitch decks

	Digital literacy	Multimedia skill	Multimodal design	Rhetorical literacy
1	3.0	3.0	4.0	3.0
2	3.0	3.0	4.0	3.0
3	2.0	3.0	2.0	3.0
4	3.0	2.0	4.0	4.0
5	2.0	3.0	2.0	4.0
6	2.0	2.0	2.0	3.0
7	2.0	2.0	3.0	2.0
8	5.0	5.0	5.0	5.0
9	3.0	3.0	3.0	3.0
10	2.0	2.0	3.0	3.5
11	3.0	4.0	5.0	5.0
12	3.0	3.0	3.0	3.0
13	2.0	2.0	2.0	3.0
14	3.0	3.0	3.0	3.0
15	2.0	2.0	3.0	3.0
16	2.0	3.0	3.0	3.0
17	3.0	3.0	2.0	3.0
18	3.0	4.0	3.0	3.0
19	3.0	4.0	4.0	4.0
20	4.0	5.0	5.0	5.0

Appendix C

Table S3
Rubric scoring for fall 22 audit decks

	Digital literacy	Multimedia skill	Multimodal design	Rhetorical literacy
1	1.0	2.0	1.0	2.0
2	1.0	1.0	2.0	2.0
3				
4	2.0	2.0	4.0	5.0
5	1.0	1.0	1.0	1.0
6	1.0	1.0	1.0	1.0
7	1.0	1.0	1.0	2.0
8	3.0	3.0	3.0	3.0
9	1.0	2.0	1.0	1.0
10	3.0	4.0	1.0	3.0
11	1.0	1.0	1.0	2.0
12	1.0	1.0	1.0	2.0
13	4.0	2.0	2.0	3.0
14	1.0	2.0	1.0	1.0
15	1.0	1.0	1.0	1.0
16	1.0	1.0	1.0	1.0
17	1.0	1.0	1.0	2.0
18	1.0	2.0	2.0	1.0
19	2.0	2.0	1.0	3.0
20	1.0	1.0	1.0	1.0
21	1.0	2.0	2.0	2.0
22	1.0	2.0	3.0	1.0
23	1.0	2.0	1.0	2.0

Appendix D

Table S4
Rubric scoring for fall 22 pitch decks

	Digital literacy	Multimedia skill	Multimodal design	Rhetorical literacy
1				
2	4.0	3.0	3.0	4.0
3	3.0	3.0	4.0	4.0
4	4.0	4.0	5.0	5.0
5	3.0	3.0	3.0	3.0
6	3.0	3.0	3.0	3.0
7	3.0	3.0	2.0	3.0
8	3.0	3.0	5.0	5.0
9	2.0	3.0	2.0	3.0
10	4.0	4.0	4.0	5.0
11	4.0	3.0	3.0	3.0
12	3.0	3.0	2.0	3.0
13	2.0	2.0	2.0	2.0
14	2.0	4.0	2.0	3.0
15	4.0	5.0	5.0	4.0
16	2.0	2.0	2.0	3.0
17	3.0	3.0	2.0	3.0
18	2.0	2.0	4.0	4.0
19	3.0	3.0	3.0	3.0
20	2.0	3.0	2.0	3.0
21	3.0	4.0	4.0	4.0
22	3.0	3.0	4.0	4.0
23	3.0	3.0	3.0	3.0