Bilgi ve Belge Araştırmaları Dergisi
The Journal of Information and Documentation Studies

Bilgi ve Belge Araştırmaları Dergisi, Sayı: 17, 2022, 81-102
DOI: 10.26650/bba.2022.17.1109755 Research Article / Araştırma Makalesi

How Post-Graduate Information Science Students Design Information Resources? Multimodal Information Literacy Perspectives*

Lisansüstü Bilgi ve Belge Yönetimi Öğrencileri Bilgi Kaynaklarını Nasıl Tasarlar? Çok Modlu (Multimodal) Bilgi Okuryazarlığı Bakış Açısı

Kübra Ayık[1], Mehmet Canatar[2]

*This article was written on the basis of Kübra Ayık's doctoral thesis.

[1]Harran University, Quality Coordinator, Sanliurfa, Turkiye; PhD Candidate, Istanbul University, Faculty of Letters, Information and Record Management Department, Istanbul, Turkiye

[2]Professor, Istanbul University, Faculty of Letters, Information and Record Management Department, Istanbul, Turkiye

ORCID: K.A. 0000-0002-6957-2758;
M.C. 0000-0002-6070-8903

Corresponding author/Sorumlu yazar:
Kübra Ayık,
Harran University, Quality Coordinator, Sanliurfa, Turkiye; PhD Candidate, Istanbul University, Faculty of Letters, Information and Record Management Department, Istanbul, Turkiye
E-mail: kubra.ozyurt34@gmail.com

Submitted/Başvuru: 27.04.2022
Revision Requested/Revizyon Talebi: 01.06.2022
Last Revision Received/Son Revizyon Talebi: 28.06.2022
Accepted/Kabul: 28.06.2022
Published Online/Online Yayın: 30.06.2022

Citation/Atıf: Ayik, K. & Canatar, M. (2022). How post-graduate information science students design information resources? multimodal information literacy perspectives. *Bilgi ve Belge Araştırmaları Dergisi, 17,* 81–102.
http://doi.org/10.26650/bba.2022.17.1109755

ABSTRACT

Information literacy have been conceptualized by numerous researchers and organizations for a long time. Especially after the prevalence of ICT and screen-based digital communication tools which make a constant connection among people, information literacy has recently been re-conceptualized regarding the new culture, user agency, and text structure. Under these conditions, individuals are seen to make meaning of existing information resources and create new information resources as the parts of socialized information construction processes. Therefore, individuals are considered active designers of information resources. In this respect, this study aims to explore how individuals design information resources which are expected to have multimodal semiotic text structure. A qualitative descriptive method was adopted, and data was analyzed both quantitatively and qualitatively. 16 post-graduate Department of Information and Records Management students joined the study. 64 information resources (participant-generated texts) were analyzed. Results demonstrate that the semiotic structure of information resources is far from having high meaning-making potential and mostly dominantly monomodal instead of being multimodal. The study recommends that information literacy education should also focus on how to design semiotic rich and multimodal information resources to be effective contributors to information construction.

Keywords: Information literacy, Multimodal literacy, Multimodal information literacy, Information science, Digital age

ÖZ

Bilgi okuryazarlığı, uzun yıllar içerisinde çok sayıda araştırmacı ve kuruluş tarafından araştırılmış ve tanımlanmıştır. Özellikle insanların sürekli çevrim içi bağlantı kurmasını sağlayan bilgi ve iletişim teknolojileri ve ekran tabanlı dijital iletişim araçlarının yaygınlığından sonra, bilgi okuryazarlığı son zamanlarda yeni kültür, kullanıcı rol/yetkinliği ve metin yapısı açısından yeniden kavramsallaştırılmıştır. Bu koşullar altında bireyler, bilginin sosyal olarak oluşturulduğu süreçlerin parçaları olarak mevcut bilgi kaynaklarını anlamlandırmak ve yeni bilgi kaynakları oluşturmak olarak görülmektedir. Bu nedenle, bireyler bilgi kaynaklarının aktif tasarımcıları ve katkı sağlayıcıları olarak kabul edilir. Bu bağlamda bu çalışma, bireylerin multimodal semiyotik metin yapısına sahip olması beklenen bilgi kaynaklarını nasıl tasarladıklarını araştırmayı amaçlamaktadır. Çalışmada nitel betimleyici yöntem benimsenmiş ve veriler hem nicel hem de nitel olarak analiz edilmiştir. Çalışmaya Bilgi ve Belge Yönetimi Bölümü'nde lisansüstü eğitim alan 16 öğrenci katılmıştır. 64 bilgi kaynağı (katılımcı tarafından oluşturulan bilgi kaynağı olan metinleri analiz edilmiştir. Sonuçlar, bilgi kaynaklarının semiyotik yapısının, anlamlı bir yapıya sahip olmaktan uzak olduğunu ve multimodal olmak yerine baskın olarak monomodal olduğunu göstermektedir. Çalışma, bilgi okuryazarlığı eğitiminin, bireylerin bilgi inşasına katkıda bulunabilmeleri için semiyotik açıdan zengin ve multimodal bilgi kaynaklarının nasıl tasarlanacağına da odaklanmasını önermektedir.

Anahtar kelimeler: Bilgi okuryazarlığı, Multimodal okuryazarlık, Multimodal bilgi okuryazarlığı, Bilgi bilimi, Dijital çağ

Introduction

Information literacy has been a substantial research topic for several decades. The concept of information literacy, which was defined and emphasized by Zurkowski in 1974, has been defined many times until today. According to ALA (1989), information literacy is a set of skills that require individuals to "understand when information is needed and can find, evaluate, and effectively use necessary information." The Chartered Institute of Library and Information Professionals (CILIP, 2018) defines information literacy as the ability to know why you need information, where and when you can find it, how to evaluate the information you find, and how to communicate it ethically. What is more, Eisenberg (2008, p. 39) defined information literacy as the ability to find, evaluate and use the information that one needs, and to filter out the information that one does not need. He expressed it as a set of knowledge and skills that allow us to find, evaluate, and use the information we need and filter out the information we do not need.

Stordy (2015) posits that these conceptions are majorly influenced by the changes and developments in the tools and mediums through which users get access to knowledge and the roles and competencies expected from users to effectively and ethically use information. This progress refers to the concept that (1) the culture including the tools/mediums and access to information, (2) the role and agency of users in literacy practices, and (3) the literacy competencies of users to make meaning the information resources and design new information resources have been changed. According to the information literacy taxonomy developed by Kress and Selander (2012, p. 267), information literacy in the digital age is considered through the lenses of new literacy approaches (i.e. Knobel and Lankshear, 2015; Lankshear and Knobel, 2006) where the access, retrieval, sharing, and semiotic structure of information have deeply changed. Literacy practices in the digital age are labeled as paradigmatic where the "new ethos," or the culture of information literacy practices, is dominant, and it is considered ideological where the information is constructed through social practices. The "new ethos," or culture, includes both the tools/mediums and social experiences of individuals while the social practices focus on the agency of users who both consume and design information resources (Lankshear and Knobel 2007). First, with the prevalence of screens and Web 2.0 tools (O'Reilly, 2005), the access and sharing of information have become time- and space- independent where a massive amount of information is accessed and shared via various media such as PCs, mobile phones, and platforms, including web sites, blogs, or social media channels. Kress and Selander (2012, p.265) remark that the digital media changed communicative patterns and access to information. This change not only results in finding information within various fields but also affected the accessibility descriptions of knowledge in different fields.

Next, it has been pointed out that "people are in constant connection" with a relatively small conversation where they share information with other people that might also be unknown. Kress

and Selander (2012, p. 265) emphasize that this sharing can be done via various semiotic text structures, such as music, films, and reportages. The constantly connected, screen-based, and user-friendly digitized mediums have altered the role and agency of people in information literacy practices. In this line, the evolutionary state is that the users are no more passive receivers of information but the active contributors of information construction, and this development shifted the agency of the individuals in information literacy practices. Unlike the traditional approaches which consider people as passive receivers and users of information, the digital media-enabled people to contribute to information creation as in social practices (Knobel and Lankshear, 2015; Lankshear and Knobel, 2006; Stordy, 2015), such as user comments in websites, social media posts, or Wikipedia entries. Therefore, people contribute to the social construction of information through creating and designing information resources as mostly screen-based or moving texts. Kress and Selander (2012), therefore, highlight that the developments in the technological tools re-arranged the social order of information literacy practices through re-constructing the roles and agencies of people. In the traditional sense, there are two poles of social interactions in the information literacy practices which are "the senders" of information and "the receivers" of information, which are the users. This approach sees the main competency of people decoding the meaning inherent in the information resources in literacy practices. Kress and Selander (2012) also posit that the contemporary approach in the digital age considers the first information resource as "prompts" which "someone who engages with it, to interpret (it or) part of it in the light of her or his interest and of her or his semiotic resources." Therefore, people can make or design new text or information resources from the initial resource. In other words, within the sense of Kress and Selander (2012), the initial maker of the information resource and the people making a new resource by re-making from the initial are creators or designers of information and information resources. Through digitized mediums, the information construction process becomes a continuing process within social participation.

Finally, the use of screens and user-friendly screens has influenced literacy practices deeply by enabling various modes of communication including visual imagery, mathematical models, moving images, touch, etc. (Jewitt et al., 2016, p. 3). Therefore, the semiotic structure of information resources has evolved, and the information is no more dominantly demonstrated through language mode but through the multimodal texts which are constructed through the deployment of various modes mentioned above (Kress, 2010). The digital media offers numerous meaning-making resources within various modes; therefore, the representations and text structure are dominantly multimodal. Kress and Selander (2012, p. 265) note that;

> To understand this new communicative pattern, it is not enough to rely on verbal text only, may they be written or oral. Other modes also come into play to handle information, share experiences, as well as to learn new things. The multi-modal character of communication, therefore, has to be understood.

Mills and Unsworth (2017, p. 1) remark that literacy practices have been always multimodal because "communication requires attending to diverse kinds of meanings, whether of spoken or written words, visual images, gestures, posture, movement, sound, or silence." But why we focus on the multimodal nature of communication and semiotic structure of information resources is explained by the increasing dominancy of multimodal texts designed by both the makers of initial information resources and multimodal texts designed by people in the re-making of existing information resources. This situation is explained by Mills and Unsworth (2017, p. 1) as "undeniably, the affordances of people-driven digital media and textual production have given rise to an exponential increase in the circulation of multimodal texts in networked digital environments." In this regard, Mills, and Unsworth (2017, p. 1) state that;

> Multimodal text production has become a central part of everyday life for many people throughout the life course, and across cultures and societies. This has been enabled by the ease of producing and sharing digital images, music, video games, apps, and other digital media via the Internet and mobile technologies.

As such, being linguistically literate is no more seen as a sufficient condition/competency to fully understand and make meaning of the multimodal information resources and design new information resources in the information literacy practices in socialized processes. At this point, Kress and Selander (2012) also remarked that this fact leads to a substantial change in the competency and ways of understanding/making meaning of the existing information resources and designing and sharing new information resources. Keeping in mind that the semiotic structure of information resources is multimodal and that individuals are active contributors to the information creation process, information literacy consists of designing effective and meaningful multimodal information resources or texts for taking part in the social construction of information through virtual platforms or social media channels. In this respect, this study focuses on the semiotic structures of information resources designed/created by individuals who are considered the active contributors to information construction through social practices.

1. Relevant Literature

In the information science and literacy research fields, multimodal literacy, new literacy, multi-literacy, transliteracy, multimodal discourse, social semiotics, and web 2.0 literacy concepts and terms have recently been discussed and explored. The first reference to multimodal literacy in the library literature was in his speech titled "Broad Horizons: The Role of Multimodal Literacy in 21st Century Library Instruction" at the World Congress of the International Federation of Library Associations and Institutions (IFLA, 2009) and in the article that followed. Cordes (2009, p. 1) emphasizes: Although reading and writing are still the basis of knowledge, literacy in this age requires a complex set of skills: these skills; access analysis, synthesis, evaluation, and use of information in various modes. Furthermore, Cordes (2009, p. 4) noted

why multimodal literacy is important for users as "the ability to successfully use knowledge in various modes is crucial to success in modern life and the workplace." Cordes also pointed out that multimodal text has various forms: cards, books, movies, websites and video games, and others. These are information resources. Each form or mode includes fields of meaning revealed by literacy processes: verbal and written communication, audio and visual media, gestural communication, spatial elements, and their combination (Cordes, 2009). Similarly, Carlito (2018), another researcher who uses multimodal literacy in Library and Information Science literature, states that information scientists and librarians should consider teaching multimodal literacy skills to their students/users. At the same time, librarians (information specialists/professionals) accept that multimodal teaching does not mean just finding an image and using it; it also includes student-centered knowledge production with conscious evaluation (Carlito, 2018).

We also see that there are researchers in the information science literature on multimodal discourse who focus on the expertise/competency of librarians/information professionals in various literacy (Hattwig et al., 2013; Koltay, 2011; Lippincott, 2007; Mackey and Jacobson, 2011). For example, Hattwig et al. (2013) state that "in the higher education curriculum, students are expected to use and produce visual media for their academic studies." In another study, Mackey and Jacobson (2011, p. 70), proposed to combine all literacy into a single "meta literacy" focused on information literacy. According to them, "information literacy in the digital age is "meta literacy" because it provides the high-level thinking needed to interact with multiple types of documents (information sources) through a variety of media formats in the collaborative environments of the digital age.". Mackey and Jacobson (2011) foregrounded the competencies of an individual in both understanding and re-making information resources as a fact of changed agencies in communication landscapes. Scholars focused on the semiotic structures of the information resources which are consumed, produced, and shared by individuals. This approach coincides with the goals of multimodality.

2. Theoretical Framework

2.1. Information Literacy

Among the traditional conceptions of information literacy, The Association of College and Research Libraries (ACRL, 2000) highlights the information seeking and a list of tasks and performance measures to evaluate individuals' skills. The traditional definition envisages information literacy as "the ability to respond to the need for information by locating, evaluating and effectively using the needed information". This is a competency-based information literacy approach that is classified as autonomous where the users are seen as passive receivers ((Stordy, 2015). The Association of College and Research Libraries - American Library Association (ACRL, 2016) revised the conception regarding the culture and social practices taking place

in online platforms, the access and sharing of information, and the roles/agencies of people in information literacy practices. ACRL 2016 information literacy framework users of information are also the creators of information. Givens et al. (2020, p. 2) remark that the ACRL 2016 framework consists of not only information discovery, but also encompasses the "awareness of the information ecosystem, its production processes, values and ethics, and how information users are also participants in the creation of new knowledge". The ACRL 2016 Framework is "organized into six frames, each consisting of a concept central to information literacy, a set of knowledge practices, and a set of dispositions." The frames are listed as; (1) Authority is Constructed and Contextual, (2) Information Creation as a Process (3) Information Has Value, (4) Research as Inquiry, (5) Scholarship as Conversation, and (6) Searching as Strategic Exploration. Givens et al. (2020) assert that, in this way, ACRL 2016 information literacy framework invalidates the competency-based autonomous standards and provides "flexible, interconnected core concepts, based in part on the emerging theory of metaliteracy where individuals are seen as consumers/receivers and re-makers/creators of information in the steady connected and socialized online environments." Instead of the notion of metaliteracy, Carlito (2018) considers multimodal literacy as a notion for literacy practices and the social construction of information resources. In this respect, the information literacy framework of ACRL 2016 sees individuals as both the users and active contributors to information literacy practices and implies that being part of the information construction process is a vital aspect of information literacy and that this participation happens through designing or creating information resources which are dominantly multimodal and sharing them. Since both make meaning of an existing information resource and re-making it are multimodal through digitized mediums, these information literacy practices are described as multimodal experiences by Carlito (2018) and Givens et al. (2020).

2.2. Multimodality and Multimodal Literacy

Mills and Unsworth (2017, p. 3) remark that "multimodality has become a significant area of research given the broadened range of available designs and media forms in digitally networked and globalized textual ecologies." The theoretical backdrop of multimodality goes to social semiotics theory (Hodge and Kress, 1988), which analyzes meaning-making in a social process and analyses the texts in their contexts. Van Leeuwen (2005, p. xi) describes social semiotics as "the way people use semiotic 'resources' both to produce communicative artifacts and events and to interpret them in the context of specific social situations and practices" and that it "compares and contrasts semiotic modes investigating how they can be integrated with multimodal artifacts and events." The semiotic resources are not only linguistic resources but also many more modes of communication, including visual imagery, mathematical symbolism, gestures, touch, odor, etc. Social semiotics considers meaningful communication as choosing from these resources and performing which is appropriate for the context. Multimodality

is indeed a theory of communication and meaning-making. It depicts communication and meaning-making practices that deploy more than one semiotic mode (Jewitt et al., 2016). Multimodality assumes that meaning is made not only through the use of one mode but with the collaboration of modes. Further, multimodal texts involve more than one mode, and total meaning emerges through making meaning of the multimodal ensembles within the text. Each distinct mode provides its affordances or meaning-making potential, and a well-designed multimodal text is good at communicating the inherent information.

Jewitt et al. (2016, p. 3) note that the three key premises of multimodality are (1) "Meaning is made with different semiotic resources, each offering distinct potentialities and limitations," (2) "meaning-making involves the production of multimodal wholes," and (3) "if we want to study meaning, we need to attend to all semiotic resources being used to make a complete whole." The multimodal literacy term was first coined by Kress and Jewitt (2003) to describe the understanding and competency in the diverse modes through which meanings are made. According to this description, information and knowledge are constructed within multimodal texts or resources, and multimodal literacy refers to accessing the meaning of these texts. According to Jewitt (2008) and Jewitt (2003), multimodal literacy focuses on the literacy practices for making meaning in existing multimodal texts and producing or designing effective meaningful multimodal texts. Regarding the information science and information literacy, the first reference to multimodal literacy is made by Cordes (2009, p. 1), who notes that although reading and writing are still the foundation of knowledge, literacy in this age means more than the ability to read and write; it requires a complex set of skills including access analysis, synthesis, evaluation, and use of information in a variety of modes.

As stated earlier, multimodal literacy involves both making meaning in existing multimodal texts and also designing multimodal texts which have high meaning-making power for the communication of information. In this respect, designing multimodal information resources cannot only be considered a design activity solely rather it is an important component of information literacy practices. Scholars(i.e. DiSessa, 2004; DiSessa and Sherin, 2000) view designing meaningful and effective texts as an element of representational competency, which refers to a capability where individuals can construct external representation. The design process involves "the ability to select, produce, and productively use representations but also the abilities to critique and modify representations and even to design completely new representations (DiSessa and Sherin, 2000, p. 387)." In this respect, it can be said that multimodal information literacy practices require representational competency for both making meaningful information resources and designing/re-making information resources.

Within this lens, individuals make meaning of multimodal information resources and re-make multimodal information processes in social and constructive practices of information literacy. Therefore, the multimodal nature of communication and the information cycle can lead

to describing information literacy as multimodal. In this respect, as one of the requirements of being literate in multimodal information, designing or creating effective and meaningful information resources or texts can be considered a research interest. In this way, it can be explored to see the semiotic structures of information resources created by individuals as part of their social and digitized information literacy practices. However, there is a paucity of studies focusing on the semiotic and multimodal structures and features of the information resources to evaluate them regarding their meaning-making values and communication power. In this respect, it can be revealed how effectively consumers of information contribute to social information creation processes.

However, considering the arguments and views so far and the relevant literature, there is a paucity of research that focuses on investigating the semiotic structure and aspects of the information resources of individuals who are viewed as active contributors to information construction with their externalized information resources. Therefore, from a multimodality perspective, this study aims to explore the semiotic structure including multimodal properties and meaning-making power of information resources created by consumers of information as part of their multimodal information literacy competencies. As such, the research questions of the study are stated below.

1. What are the semiotic properties of information resources designed by post-graduate level Department of Information and Records Management students?

2. What is the communication/meaning-making power of multimodal information resources designed by post-graduate level Department of Information and Records Management students?

3. Method

This study has a qualitative descriptive research design that includes multimodal discourse analysis of information resources designed by participants (Tang and Danielsson, 2018). Braun and Clarke (2019, p. 21) state that qualitative research does not provide a single and universal answer; it attaches great importance to context and can be empirical or critical. They add that there is always an ontological approach that guides every qualitative research. Does this ontological approach presume that reality is independent of or constructed by human cognition? The ontological approach adopted by this study is the approach postulated by the constructivist philosophy. According to the constructivist theory, knowledge is constructed and developed by the individual's building of new knowledge on his previous knowledge and experiences through his own life (Savin-Baden and Major, 2013). Therefore, the information resources designed by participants are considered products of their previous experiences and skills developed through their educational lives.

3.1. Procedure and Research Setting

The current study was conducted as a part of the first author's doctoral research. The study was conducted with sixteen post-graduate Department of Information and Records Management students who were studying at the Master's level, voluntarily designed texts, and were informed about the context of the research. Participants were Master's level students from Istanbul University, Department of Information and Records Management. The participants previously had taken a course on information literacy at the undergraduate level. The research is conducted via virtual platforms and tools under Covid-19 pandemic circumstances. Participants were asked to visit a website of an academic library of a university in Turkey and design information resources to present their classroom. Next, participants were asked to gather information about the user facilities of libraries and design presentations to present them. In this regard, each participant designed a PowerPoint to represent the information they gathered with their comments. Participants were given a total of two weeks to fulfill this duty. In presenting the data, pseudonyms are used.

3.2. Data Collection

Participants designed their information resources and presented them in the context of the course they had been taking. Researchers did not make any change or intervention in any participant-generated information resources. Each participant's four information resources were analyzed, and a total of 64 texts were obtained. The texts were designed in digital tools; therefore, they are digital information resources that can be designed by the deployment of various modes and representational choices.

3.3. Data Analysis

Multimodal information resources are considered to involve diverse types of representations within different modes. O'Halloran (2007) points out that on a static multimodal text, language mode, visual imagery mode, and mathematical model can co-operate together to construct meaning. Multimodal representation analysis is a data analysis strategy that can reveal the representational value of text regarding constituent semiotic resources and text arrangement (O'Halloran, 2007). In this research, the analysis of information resources involved two stages. The first stage engaged the determination of representational variations in the text. The second stage was done to determine the semiotic richness in the designed texts. The semiotic richness of information resources texts was determined to evaluate the meaning-making value of texts and the design choices in designing information resources.

3.3.1. Representational variations

The representational variations were measured in the following procedure. Representations were firstly classified as linguistic (written language) and non-linguistic representations. Further,

the non-linguistic representations were categorized into three groups, which are iconic/symbolic, schematic, and charts/graphs. According to Lemke (1998), iconic representations have physical resemblance with their referents for example images representing a process or an entity such as running or a pen. What is more, these representations can signify processes, participants, or circumstances with which they maintain similar physical structures. O'Grady and O'Grady (2008, p. 93) state that symbolic representations are abstract signs which are based on socially generated symbol systems and do not have any physical or structural resemblance with what they demonstrate or represent. For example, the symbol for "Biohazard" is a symbolic representation that does not have any physical resemblance with the referent. Second, schematic representations function to "identify components and represent hierarchies, and flow of processes" (Gebre and Polman, 2016, p. 2674). Flowcharts and organizational charts are viewed as exemplary cases of this kind of representation. Finally, charts and graphs are representations that show the quantitative relationships between the entities, participants, or processes. Gebre and Polman state that these kinds of representations are appropriate and effective for concretizing abstract information. Examples of this category are line graphs, pictographs, tables, or bubble charts.

3.3.2. The Dimensionality of Representation as Parameter of Semiotic Richness of Representations

Determining the dimensionality of representations is initiated by revealing the communicative functions of each type of non-verbal representation in a text. This is done by describing the information purpose of each representation. In other words, what does each representation stand for regarding the information? Does the used representation provide different information or repeat the same information with another linguistic or non-linguistic representation deployed in the text as information resources? Gebre and Polman state that these questions can be answered by the determination of what information is communicated with each representation within the text. This data helps to figure out if the used representation provides new information or repeats information presented by other linguistic or non-linguistic representations in the text. The dimension is viewed as an "aspect of the represented topic/content that is communicated by one type of representation." Therefore, the higher number of dimensions refers to the meaningful and economic use of representations or semiotic resources in a non-repetitive (redundant or parsimonious) way for the construction of messages in the information resource.

The dimensionality ratio is calculated through the division of the amount of information by the number of used non-verbal representations, i.e., the number of dimensions from non-verbal representations by the number of non-verbal representations in the text. The dimensionality ratio is ranged from less than 1 to 1, and greater than 1 means that one or more of the used representations communicate more than one piece of information. In addition, the semiotic richness is seen as the effective and meaningful use of representations in information resources. The creativity aspect deals with the use of various types of verbal and non-verbal

representations which communicate distinct messages. What is more, these representations complement each other and co-operate together to construct a unified and complete message in the information resource. Such a construction of information resources involves appropriate mode and representational choices in designing information resources since the text does not include parsimonious, distinct-but-related representations and uniqueness across representations demonstrating a whole message (Gebre and Polman, 2016).

Guided by the strategy developed by Gebre and Polman (2016) mentioned above, a multimodal information resource analysis observation protocol was developed (see Figure 1). The chart was used to analyze designed information resources and quantitatively demonstrate the design choices and meaning-making power of information resources. The chart provides quantitative data about the text's representational characteristics and semiotic richness.

<table>
<tr><td>Verbal Reps.</td><td colspan="6">Non-Verbal Representations</td></tr>
<tr><td>Frequency</td><td>R(f)</td><td colspan="3">Representation Type</td><td>Iconic/ Symbolic</td><td>Schematic</td><td>Graph/ Chart</td></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td>1</td><td>2</td><td>3</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td colspan="3">Number of Dimension (D)</td><td colspan="5">Dimensionality Ratio (R/D)</td></tr>
<tr><td colspan="3"></td><td colspan="5"></td></tr>
</table>

Figure 1: The observation protocol for multimodal representational analysis of information resources

For demonstrating the multimodal aspects and meaning-making power of information resources designed by participants, the texts were analyzed quantitatively and qualitatively. In the end, to answer the first question, verbal and non-verbal representational choices in information resources were analyzed. To answer the second question, the dimensionality ratio or the semiotic richness of representations in diverse modes was analyzed.

4. Findings

In the first part of the findings, quantitative data is presented. The quantitative data encompasses the total number of representational choices, the frequency of text regarding the number of types of non-verbal representations, the frequency of non-verbal representations, and the total dimensionality ratio, which is a parameter of dimensionality and semiotic richness. In the second part, four exemplary cases of student texts are presented and have been qualitatively analyzed.

4.1. Quantitative Results

In Figure 1 below, the frequency of representational choices regarding linguistic and non-linguistic representations for all 64 texts are represented. Representations are considered as the smallest meaning unit providing information. For linguistic representations, the smallest meaning unit is considered a sentence. Data demonstrates that there exists a total of 271 representational choices and that among these choices, 232 of them are linguistic representations in language mode, which corresponds to 84%. The data also demonstrated that 39 (14%) of representational choices in all text are non-verbal, including symbolic/iconic, schematic, or mathematical (graphs, charts, etc.) representations. This means that the dominant mode in information resources is the language mode. The limited use of modes other than the language mode refers to lesser affordance, and it causes low meaning-making power in demonstrating information.

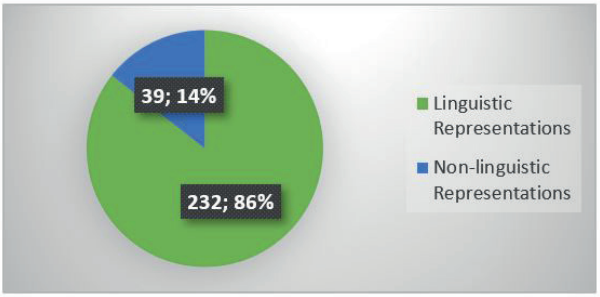

Figure 2: Frequency of representation modes

Figure 3 below demonstrates the mode structure and mode choices of the information resources. The data shows that 52 of 64 texts were in monomodal structure, 46 of which were in language mode and 6 of which were in visual imagery mode. Next, 14 of 64 information resources were designed as multimodal text. This means that only 14 % of information resources were in multimodal text structure. It is well known that screens, especially user-friendly screens, provide vast design facilities in terms of modal and representational choices. The result can be interpreted as the majority of participants not employing other modes and their affordances in designing information resources.

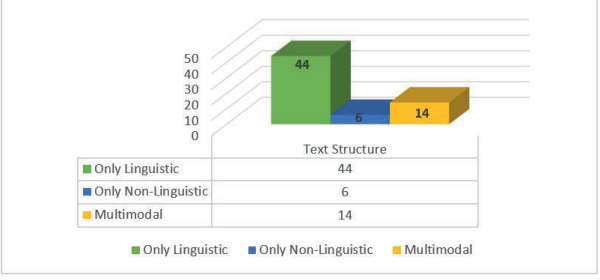

Figure 3: Frequencies of texts regarding mode structure

Figure 4 below displays the frequencies of deployed non-verbal representation types in all multimodal and only non-linguistic information resources. As noted earlier, there were a total of 39 non-linguistic representations in the designed information resources. 26 of the non-linguistic representations were schematic, 9 were iconic/symbolic, and only 4 were mathematical representations, including charts or graphs. As stated early, schematic representations show the realistic physical phenomena or entities as accurately as possible to the referent. Significantly, participants opted to demonstrate the information by use of schematic choices. For example, a photo or cartoon drawing of a scene in the library or a picture of a tool used in the library is demonstrated through schematic representations. The low amount of use of mathematical representation was due to the absence of quantitative or mathematical relations between the entities taking place in the information pieces. Nevertheless, some participants provided quantitative information through the use of mathematical representations. The iconic/symbolic representations mostly included icons used in libraries or logos signifying a particular institution or organization. Icons were generally used instead of verbal representations with schematic representations.

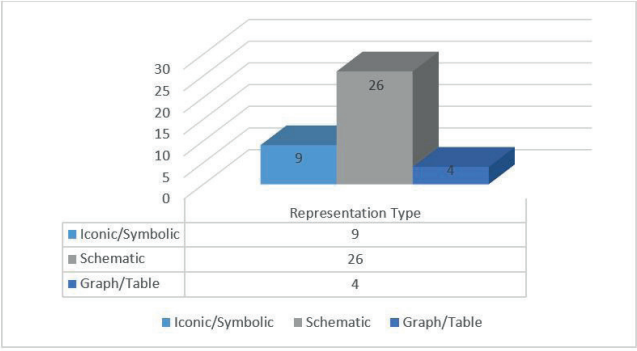

Figure 4: Frequencies of non-linguistic representation types

Figure 5 below shows the frequency of texts regarding how many different non-linguistic representation types they included. As stated earlier, there were a total of 20 texts or information resources including non-linguistic representations. 19 (95%) of the 20 texts were included with one type of non-linguistic representation. This means that participants did not deploy a variety of non-linguistic representation types in their designs. These were mostly schematic representations. It can be said that the deployment of representation types is somewhat dependent on the subject or the topic. For example, if they introduce an institution itself, they opt for iconic/symbolic representations. Likewise, if they demonstrate a certain unit of a library, they generally use schematic representation in their designs. Nevertheless, such preference ratio regarding non-linguistic representation types is limited for using affordances of meaning-making power of representation to make their information resource have high meaning-making power and effective.

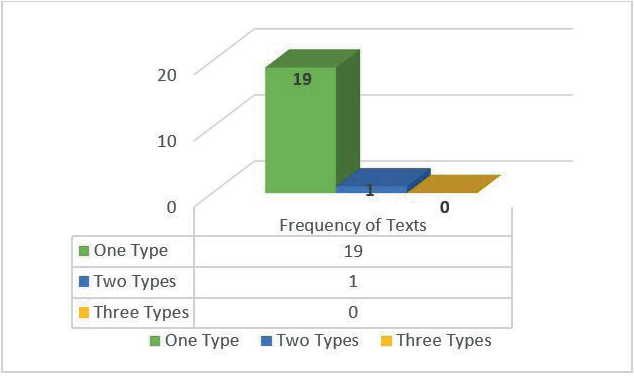

Figure 5: Frequencies of texts regarding the non-linguistic representation types

Figure 6 below shows the dimensionality ratios of all information resources. After the analysis of each information demonstrated by each verbal and non-linguistic representation, it was decided whether a non-verbal representation repeated the information that existed in another representation (including verbal representations) and demonstrated information that was not demonstrated by another representation in the texts or demonstrated more than one information. After obtaining this data, the dimensionality ratio for each representation was calculated. The dimensionality ratio or semiotic richness was considered to be an indicator of the effective, economic, and conscious design choices in the information resources. The data demonstrates that 48 information resources had a dimensionality ratio lower than 1. 14 information resources had a dimensionality ratio equal to 1. The dimensionality ratio of 2 information resources was calculated as greater than 1. These findings show that the majority of information resources were limited in terms of meaning-making power and affordance in demonstrating information to other people. Furthermore, the situation demonstrated that the representations and the including mode choices were ineffective and non-economic since they repeated the similar information which already existed in another representation. The users of the majority of information may struggle in making meaning and understanding the content. As (Herrlinger et al., 2017) noticed, this situation may even distract readers' attention when they read the information resources and cause a decrease in their understanding of the information.

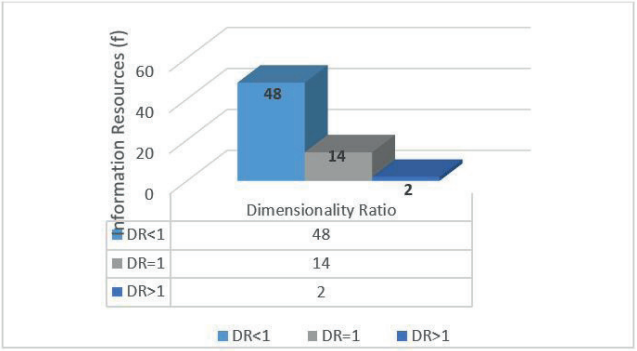

Figure 6: Frequencies of texts regarding dimensionality ratio (semiotic richness)

4.2. Exemplary Cases of Information Resource Designs by Participants

This part includes the analysis of exemplary cases. These information resources are the chosen way to demonstrate various cases regarding mode structure, non-linguistic representation types, and the dimensionality ratio of information resources. The information resource demonstrated in Figure 7 contains information about the technical facilities of a library. There are 3 meaning units at the sentence level. All the smallest information or meaning units are demonstrated through linguistic representations. Therefore, all the design choices involve linguistic representations. This text is considered limited in making meaning of the information since there might be other representational and mode choices to better demonstrate some information pieces. For example, there should be icons for CDs or symbols for explaining the cataloging process. In this way, the information could be demonstrated in an easier, quicker, and more understandable way. What is more, this text is only understandable for people who can read Turkish. The use of other non-linguistic representation types could make the information resource understandable to other people who cannot read Turkish. In the end, the dimensionality ratio is zero since there is no information demonstrated by non-linguistic representations.

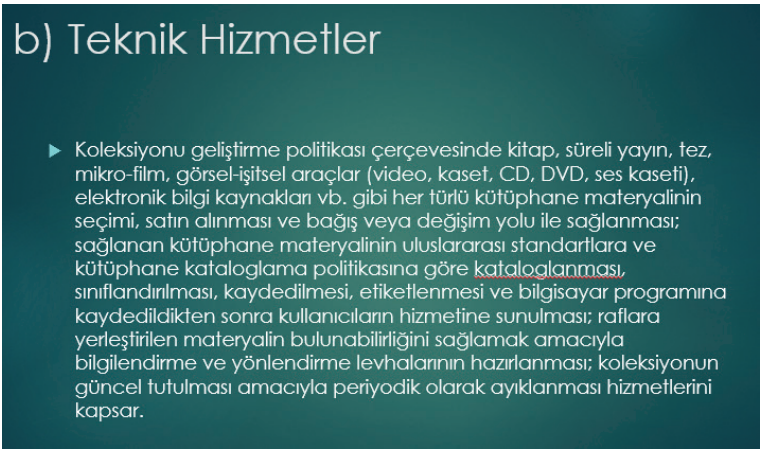

Figure 7: An information resource designed by participant 1

The information resource demonstrated in Figure 8 contains information about special collections and rare collections in a library. There are a total of 4 meaning units at the sentence level. Similar to Figure 7 above, all the smallest information or meaning units are demonstrated through linguistic representations, and therefore all the design choices involve linguistic representations. The dimensionality ratio is zero since there is no information demonstrated by non-linguistic representations. This text is also considered limited in making meaning of the information since there might be other representational and mode choices. For example, there should be a schematic representation for demonstrating the location of the collection. In this way, it could be easier to find the place of the collection for people who are unfamiliar with the library. What is more, there should be a timetable and clock icon for demonstrating the work hours. This can make the information resource richer in semiotic and mode structure and each to make meaning. It must be noted that, as shown in Figure 2, the majority of information resources are in the same mode and semiotic resource structure similar to this information resource and information resource demonstrated in Figure 7.

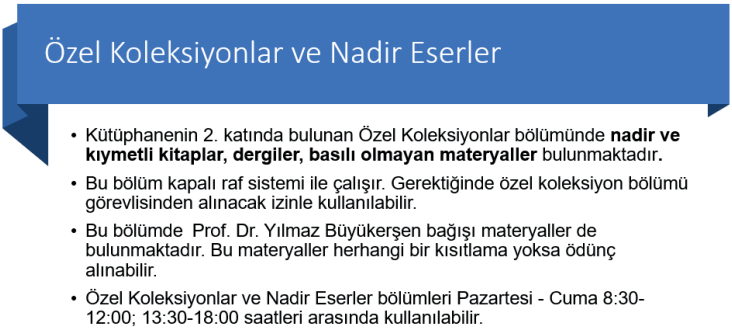

Figure 8: An information resource designed by participant 5

The information resources demonstrated in Figure 9 are multimodal information resources or a multimodal text including language mode and visual imagery mode. It contains information about the voice books of the library and how to access them through internet-connected digital tools. There are 7 linguistic representations and 8 non-linguistic representations. In the text, there are 4 iconic/symbolic and 4 schematic non-linguistic representations. Therefore, two different types of non-linguistic representations are deployed. There is a total of 10 pieces of information demonstrated by non-linguistic representations and not demonstrated by linguistic representations. This situation tells us that there are some non-linguistic representations involving more than one piece of information. For example, the bookshelf in a cellular phone (schematic representation) demonstrates two pieces of information. First, there is a voice book collection in the library; second, it is accessible even if the user is outside the library via internet-connected mobile devices. Therefore, the dimensionality ratio is 1.2 which is greater than 1. This information resource is semiotic rich and understandably presents the information. The design of the information resource included several design choices, which are benefits of the screen and design tools provided by screen-based applications.

Figure 9: An information resource designed by participant 9

The information resources demonstrated in Figure 10 are also multimodal information resources or a multimodal text including language mode and visual imagery mode. It contains information about the security of books inside the library. There are 2 linguistic representations and 4 non-linguistic representations. In the text, there are 4 schematic non-linguistic representations. Therefore, a single type of non-linguistic representation is deployed. There is a total of 4 information demonstrated by non-linguistic representations and not demonstrated by linguistic representations. This situation tells us that all the non-linguistic representations provided only one piece of information. Each picture provided information about where the security seal can be located inside the books. The dimensionality ratio equals 1. This is a typical example of non-verbal representations involving only one piece of information which is not included in the linguistic representations. This information resource can be seen as semiotic richer and presents the information more understandably in comparison to information resources demonstrated in Figure 7 and Figure 8.

Figure 10: An information resource designed by participant 13

Discussion and Conclusion

This study explored the semiotic structure of information resources designed by post-graduate Department of Information and Records Management students who have taken information literacy courses. Current information literacy approaches (Stordy, 2015; Givens et al., 2020) view individuals as active contributors to the construction of information across a variety of virtual platforms and networks. The term multimodal literacy is used to attribute individuals to have competency in making meaning and designing information resources who are dominantly multimodal. 64 information resources were analyzed according to their semiotic properties, which include mode structure and choices, representation type choices, and dimensionality ratio, which shows the conscious design and meaning-making power of designed texts. It is surprising that although the participants designed their information resources by using digital tools, the majority of information resources were monomodal involving language mode. The data also shows that the texts were quite limited regarding representation choices. Finally, the meaning-making power of information resources was found to be low due to the absence of semiotic richness in the design choices.

This situation can be interpreted firstly in the following: Serafini (2015) notes that multimodal literacy is a literacy practice that can be taught to individuals like traditional literacy. Therefore, individuals should have explicit learning experiences regarding how to design effective multimodal information resources. Another reason for the limited semiotic properties of information resources could be that the participants do not have enough consciousness regarding whether they are active contributors to their designs. In other words, the social nature of information literacy practices via novel digital tools and platforms cannot be comprehended sufficiently. Therefore, the information literacy education must take the three facts mentioned in the introduction part into account, and the information literacy education must be based on authentic learning experiences across a variety of social experiences.

The implication to Information Literacy and Information Specialists/Professionals: Further research in this field can be done to reveal information literacy practices in social virtual platforms such as social media and microblogging. What is more, further research can be done on how to improve the multimodal information literacy competencies of individuals, especially information scientists.

Peer-review: Externally peer-reviewed.
Author Contributions: Conception/Design of Study- K.A., M.C.; Data Acquisition- K.A.; Data Analysis/Interpretation- K.A., M.C.; Drafting Manuscript- K.A., M.C.; Critical Revision of Manuscript- K.A., M.C.; Final Approval and Accountability- K.A., M.C.
Conflict of Interest: The authors have no conflict of interest to declare.
Grant Support: The authors declared that this study has received no financial support.

References

Association of College and Research Librararies - American Library Association. (2016) *Framework for information literacy for Higher Education*. https://www.ala.org/acrl/sites/ala.org.acrl/files/content/issues/infolit/framework1.pdf

American Library Association. (2006). *Presidential committee on information literacy : Final report*. http://www.ala.org/acrl/publications/whitepapers/presidential

Braun, V., ve Clarke, V. (2019). *Successful qualitative research: A practical guide for beginners*. SAGE Publications.

Carlito, M. D. (2018). Supporting multimodal literacy in library instruction. *Reference Services Review*, *46*(2), 164-177. https://doi.org/10.1108/RSR-02-2018-0015

Coonan, E., Geekie, J., Goldstein, S., Jeskins, L., Jones, R., Macrae-Gibson, R., Walton, G. (2018). CILIP definition of information literacy 2018. *CILIP Information Literacy Group*, 1-8.

Cordes, S. (2009). Broad Horizons: The role of multimodal literacy in 21st century library instruction. *IFLA: World library and information congress, 75th IFLA general conference and assembly*. https://www.ifla.org/past-wlic/2009/94-cordes-en.pdf

DiSessa, A. A. (2004). Metarepresentation: Native competence and targets for instruction. *Cognition and Instruction*, *22*(3), 293-331. https://doi.org/10.1207/s1532690xci2203_2

DiSessa, A. A., ve Sherin, B. L. (2000). Meta-representation: An introduction. *Journal of Mathematical Behavior*, *19*(4), 385-398. https://doi.org/10.1016/S0732-3123(01)00051-7

Eisenberg, M. B. (2008). Information literacy: Essential skills for the information age. *DESIDOC Journal of Library & Information Technology*, *28*(2), 39–47. https://doi.org/10.14429/djlit.28.2.166

Gebre, E. H., ve Polman, J. L. (2016). Developing young adults' representational competence through infographic-based science news reporting. *International Journal of Science Education*, *38*(18), 2667-2687. https://doi.org/10.1080/09500693.2016.1258129

Givens, M., Holdsworth, L., Mi, X., Rascoe, F., Valk, A., ve Viars, K. E. (2020). Multimodal information literacy in higher education: Critical thinking, technology, and technical skill. https://smartech.gatech.

edu/bitstream/handle/1853/62433/multimodal%20information%20literacy%20complete%20draft%20with%20revisions.pdf

Hattwig, D., Bussert, K., Medaille, A., ve Burgess, J. (2013). Denise Hattwig, Kaila Bussert, Ann Medaille, Joanna Burgess. *Portal: Libraries and the Academy*, *13*(1), 61-89.

Herrlinger, S., Höffler, T. N., Opfermann, M., & Leutner, D. (2017). When do pictures help learning from expository text? Multimedia and modality effects in primary schools. *Research in Science Education*, *47*(3), 685-704. https://doi.org/10.1007/s11165-016-9525-y

Hodge, R., ve Kress, G. (1988). *Social semiotics*. Cornell University Press.

Iannuzzi, P. (2000). Information literacy competency standards for higher education. *Community and Junior College Libraries*, *9*(4), 63-67. https://doi.org/10.1300/J107v09n04_09

Jewitt, C. (2008). Multimodality and literacy in school classrooms. *Review of Research in Education*, *32*, 241-267. https://doi.org/10.3102/0091732X07310586

Jewitt, C., Bezemer, J., ve O'Halloran, K. (2016). Introducing multimodality. In *introducing multimodality*. https://doi.org/10.4324/9781315638027

Lankshear, C. ve Knobel, M. (2007). Sampling "the New" in new literacies. M. Knobel ve C. Lankshear (Eds.), *A new literacies sampler* içinde (ss. 1-24). Peter Lang.

Koltay, T. (2011). The media and the literacies: Media literacy, information literacy, digital literacy. *Media, Culture and Society*, *33*(2), 211-221. https://doi.org/10.1177/0163443710393382

Kress, G.. (2010). *Multimodality: A social semiotic approach to contemporary communication*. Routledge.

Kress, G., ve Jewitt, C. (2003). *Multimodal literacy*. Peter Lang.

Kress, G., ve Selander, S. (2012). Multimodal design, learning and cultures of recognition. *Internet and Higher Education*, *15*(4), 265-268. https://doi.org/10.1016/j.iheduc.2011.12.003

Lankshear, C. ve Knobel, M. (2006). *New literacies: Everyday practices and classroom learning* (2nd ed.). Open University Press. https://doi.org/10.4324/9781315390789-4

Lemke, J. L. (1998). Multimedia literacy demands of the scientific curriculum. *Linguistics and Education*, *3*(10), 247-271.

Lippincott, J. K. (2007). Student content creators: Convergence of literacies. *Educause Review, 42*(6), 16-17.

Mackey, T. P., ve Jacobson, T. E. (2011). Reframing information literacy as a metaliteracy. *College and Research Libraries*, *72*(1), 62-78. https://doi.org/10.5860/crl-76r1

Mills, K. A., ve Unsworth, L. (2017). Multimodal literacy. In *Oxford Research Encyclopedia of Education* (Issue February). https://doi.org/10.1093/acrefore/9780190264093.013.232

O'Grady, J. V., ve O'Grady, K. V. (2008). *The information design handbook*. How Books.

O'Halloran, K. L. (2007). Systemic functional multimodal discourse analysis (SF–MDA) approach to mathematics, grammar and literacy. In A. McCabe, M. O'Donnell, ve R. Whittaker (Eds.), *advances in language and education* (pp. 77-102). Continuum.

O'Reilly, T. (2005, September 30). *What is Web 2.0*. https://www.oreilly.com/pub/a/web2/archive/what-is-web-20.htmlhttps://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html

Savin-Baden, M., ve Major, C. H. (2013). *Qualitative research: The essential guide to theory and practice*. Routledge.

Serafini, F. (2015). Multimodal literacy: From theories to practices. *Language Arts*, *92*(6), 412-423.

Stordy, P. H. (2015). Taxonomy of literacies. *Journal of Documentation*, *71*(3), 456-476. https://doi.org/10.1108/JD-10-2013-0128

Tang, K. S., ve Danielsson, K. (2018). Global developments in literacy research for science education. In *global developments in literacy research for science education*. Springer International Publishing. https://doi.org/10.1007/978-3-319-69197-8

van Leeuwen, T. (2005). *Introducing social semiotics: An introductory textbook*. Routledge.

Zurkowski, P. G. (1974). The information service enviroment relationships and priorities. *National Commission on Libraries and Information Science*, 1-30. https://doi.org/ERIC Number: ED100391