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Exploring the Design Patterns That Elementary School Students Use to Create Multimodal Display Boards in a Classroom Project

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I. Introduction

Evolving perspectives on literacies consider not only written language that conveys information but also alternative modes such as images, colors, and shapes as important tools for sophisticated meaning making (Kress, 2003; New London Group, 1996; Sheridan & Rowsell, 2010). Research suggests that students actively use and coordinate multimodal tools and resources to represent information, knowledge, and perspectives in a creative way (Jewitt, 2005; Walsh, 2007). As recent educational policies worldwide emphasize, it is critical to teach students the ability to analyze, choose, and remix diverse modes of meaning making for their active and successful participation in today's multimodal text environment (European Council, 2006; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). Despite the urgent call, however, our understanding of how children use multimodal resources and tools in a classroom setting and how they develop related skills and knowledge is tenuous (Edwards-Groves, 2011; Kress, 2010). This lack of understanding is a fundamental obstacle for the design of instructional strategies to help students develop important literacy skills and identities as agentive sense-makers. As a preliminary step toward a more de-

tailed understanding of multimodal literacies, this study examines elementary students' multimodal designing practice of creating a project display board as part of inquiry-based classroom learning.

II. Background

1. Theoretical perspectives

Our study is informed by perspectives on multimodality, genre, and design. We first consider the idea of *multimodality* to be important for framing our study. Mode is a way in which meaning is expressed and communicated, and modality is what a mode can afford as one uses the mode to express and communicate meaning. That is, multimodality allows diverse tools and resources for authors and readers attempting to achieve the goals for their practices. For example, Kress (2010) elaborated the meaning of multimodality, comparing writing and image as two unique modes. Writing is conventional, and it sequentially organizes information with letters, words, sentences, and paragraphs. The order of reading—what to read now, and next—is predetermined mainly by the author, and the reader of written text is positioned as a passive meaning-maker following through the predetermined order. In contrast, image is relatively a more flexible mode that displays information spatially. Image encourages the reader to be active in determining what parts of the image are attended to, how her or his attention is distributed, and how strategically a reading focus shifts in the spatial structure. Therefore, multimodal authors make critical choices about which modes to use and how to interrelate them, and these choices are evidence of how they construct and represent meaning (Bearne & Wolstencroft, 2007; Rowsell & Pahl, 2007).

Genre is another consideration in the framing of our study. Genre is a cultural norm of text creation among the groups of people sharing expectations and purposes (Prior, 1998; Rusell, 1997). From this

perspective, the way of communication between text participants—the author(s) and the reader(s)—heavily relies upon the particular genre expectations and functions that they share toward achieving goals for their communication (Bazerman, 2003). In other words, authors with genre awareness are able to respond to the question of who communicates with whom for what purposes (Kress, 2003). For example, to write a research report as a conventional genre of exposition, the author should organize information in a linear fashion to meet a firmly received organizational structure to disseminate knowledge among the group of domain experts. On the contrary, creating a poster allows for flexible use of visual modes of information representation that appeals to the audiences' attention and the autonomy of their choices of reading order. Mindful authors understand such distinctive expectations and ways of interactions expected in different genres and coordinate their meaning-making processes in response to the perceived genre expectations and purposes. Hence, to help students understand the process of multimodal text creation, instruction should support their meta-knowledge of how different modes work in author-audience transactions and how such multimodal experiences are shaped by particular genre expectations (Bowen & Whithaus, 2013).

Finally, we take the notion of *design* into account because in this study we are interested in identifying the design features from student artifacts. Sophisticated authors transform their responses to a particular genre into the design of meaning, utilizing multiple modes of information representation. According to Kress and Van Leeuwen (2001), the design of text and discourse requires the author to make decisions about what modes to use and how to arrange the content. Design is not confined to written letters and words, but combines any or all of modes to represent information and construct meaning in a more sophisticated manner (Black, 2005). Thus, one must make sense of what modes in what combination will best meet the demands of specific genres, purposes, and audiences, surely recognizing the rules of multimodal text design (Gee, 2007; Sheridan & Rowsell, 2010). To

conclude, our perspectives suggest that fluent text designers choose, coordinate, and alternate multimodal design features in linguistic, visual, and spatial forms to meet different genre expectations for the specifically intended audience.

2. Previous research

Multiple lines of research have examined students' multimodal composition practices. First of all, there exist empirical studies that observed children performing a writing task in and out of classroom settings. For example, some of these studies analyzed fewer cases of young authors to describe how they use visual modes of meaning making to complete a classroom writing task such as story card making and dry-wipe whiteboards writing (Hull and Nelson, 2005; Mavers, 2009; Ormerod & Ivanič, 2002; Shanahan, 2013). Also, other studies described the differences and transition of students' multimodal text compositions such as a picture diary composition (Ok & Seo, 2011) and map-making activities in school and out-of-school settings (Anning, 2003; Pahl, 2001). These studies have provided detailed descriptions of young individuals taking advantages of multimodal tools and resources for writing. However, these case studies with fewer participants are somehow limited in describing the patterns of multimodal engagement across the individuals or the contexts of writing.

Notably, a larger number of studies examined how students make meanings with digital tools and media. For example, some studies analyzed how digital devices and applications facilitate students' creation of conventional literary genres such as poetry authoring (Curwood & Cowell, 2011; Hughes, 2009), storybook making (Rojas-Drummond, Albarrán, & Littleton, 2008; Yang & Wu, 2012), and class yearbook making (Jeong, 2009). Other studies focused on the nature of digital literacy contexts, which can promote students' engagement in newer genres of writing, such as digital video production (Bruce 2009; Kearney & Schuck, 2006; Ranker, 2008; 2012), power point slides creation

(Gunel, Hand, & Gunduz, 2006; Kimber, Pillay, & Richards, 2007), and online webpage composition (Fernandez-Cardenas, 2008; Walsh, 2007). These studies are valuable in that they add new insights to multimodal authoring practices as technologies allows for easier and more flexible tool uses for text creation. However, less is still unknown about how students switch their attention and resource use when transforming their artifacts from a conventional writing genre to a different genre of visual modes.

Taken together, research has contributed to the account of the nature of multimodal literacy practices engaged by student authors with authentic goals and tasks. Also, the studies reviewed above have identified the affordances and constraints of various traditional and new modes of authoring, suggesting what should be considered in the building of effective instructional strategies and resources for multimodal literacy development. However, more research effort should be invested to examine elementary children's multimodal practices and their development of the requisite skills and knowledge, in spite of the majority of the studies with secondary students. Research on multimodal practices in a particular domain of knowledge or discipline is also rare (Prain & Waldrip, 2006; Scott & Jewitt, 2003). Finally, little research studied the complexity of genre transformation (Mills, 2001; Siegel, 2006), which may influence students' use of multimodal tools and resources.

In conclusion, we view that an under-researcher area of study is younger students' creation and transformation of multimodal texts while they interact with meaning-making tools, genre expectations, and intended audience in a classroom setting. In the present study, we analyze the large number of multimodal artifacts (i.e., project display boards) generated by elementary students. These students participated in year-long inquiry-based lessons—developed and taught by teachers of language arts and science—, composed a research report based upon the inquiry, and finally created a visual display board to exhibit their learning in front of teachers, parents, and other

classmates. Three research questions drive our investigation:

What design patterns can be found from elementary students' creative display boards?

What insights can be drawn from the identified patterns in regard with these students' awareness of multimodal tools, genres, and audiences?

IV. Research Methods

1. Participants and Context

The study was conducted at an elementary English dual-immersion school in the largest urban school district in Korea. The entire body of students in grades 4-6 (n = 425) participated in the lessons. Two teachers co-developed these inquiry lessons and co-taught for the students throughout the entire academic year. Each lesson had 80 minutes of class time and was implemented once a week. The main lesson objective was to help students become creative thinkers and competent self-regulated learners through multiple interdisciplinary inquiry projects. Students were encouraged to choose their own inquiry topics across diverse content domains and to develop research questions based upon their inquiry with different sources of information, including both print materials (e.g., books, magazines) and digital sources (e.g., websites, photos, films). First nine lessons were devoted to teaching inquiry skills. Upon completion of the inquiry projects, the following 12 lessons were geared toward writing instruction to help students create a research report based upon their inquiry. The last 10 lessons were designed for project display board creation, as will be explained in detail in the following subsection.

2. Procedure and Data Sources

Creative display board production was a final task that students

were asked to complete toward the end of the year-long inquiry-based lessons. In the final 10 lessons, two lessons were taught to prepare students for creating a display board before they started to make it. First lesson was about what display boards are like with follow-up discussions about the properties of exemplary artifacts. The, the second lesson included the teaching of visual modes such as pictures, color, graphs, tables, and so forth, which students can utilize during the display board designing. In addition to that, students were given the opportunities to reflect on their purpose of display board production and the audiences that they have to consider in the production process. After these lessons were done, students were guided to draft an outline of their display boards on the worksheet that the teachers offered. Then, they started to design a display board based on their plans and the already written research reports. Teachers supported students by providing sufficient resources and materials and did not interfere students' design processes. All students without an exception submitted their own display board, and finally, the total of 425 display boards were collected as the data for the multimodal design pattern analysis.

3. Data Analysis

Data analysis was comprised of three phases, adopting the guidelines and techniques delineated in the Genre and Multimodality framework for the analysis of multimodal design patterns (Bateman, 2008) as well as grounded theory approaches to qualitative data analysis (Glaser & Strauss, 1967). These phases include *base layer* identification, *layout layer* analysis, and constant-comparison for *pattern recognition*. First of all, we decomposed each student's display board into the base layer that consists of several basic units of multimodal information representation. We coded base units as idea connections (e.g., transitions), functional units (e.g., headings and subheadings), visual displays (e.g., photos, drawing), and visual representation (e.g., charts, tables, graphs).

Table 1. Data analysis phases an the resulting identification of units, layers, and components of multimodal design in this study

Phase of design analysis	Identified multimodal feature		
Base layer Analysis: To identify the array of base units that function as parts of layout layers	Identified base units and the codes:		
	B: Idea Box C: Connection (lines, arrows, polylines) c: Caption D: Drawing	d: Diagram F: Floating text G: Graphs H: Headlines I: Icon (shapes, bulleting, numbering)	L: Lines (horizontal and vertical) P: Photograph T: Text t: Table
Layout layer Analysis: To identify the layout units that organize base units with similar properties	Identified layout units include paragraphs, drawings, photos, and captions. Three domains include (1) conceptual structure between layout units, (2) typographical or visual features of layout units, and complex area model which refers to the placement of layout units in a layout.		
Comparing and Grouping To analyze similarities and differences of each case's complex area model	Three identified components of multimodal text composition: (1) design (layout structure), (2) multimodal patterns (elements of representation), and (3) consideration of audience (elements of communication)		

Next, we analyzed a layout layer to recognize idea chunks (e.g., relevant and irrelevant ideas) and judge whether or not they were organized in a consistent and cohesive manner in relation to the student's chosen topic. We then detail a complex area model that visualizes the structure of the layout unit identified in each display board.

Finally, we compared and contrasted the result of each case analysis in order to identify the design patterns that indicate certain multimodal authoring profiles. Based upon these patterns, we grouped display boards into superordinate categories to make inferences about how these student authors considered multimodal tools, genre expectations, and intended audiences. We note that, although the three analytical phases here were delineated operationally, these processes were recursively performed throughout the entire course of data analysis. As a result of our data analysis, Table 1 offers descriptions of the three analytical phases and the outcomes resulting from each phase.

III. Major Findings

Our qualitative analysis of elementary students' project display boards indicate that the ways in which these young authors choose and mix different modes of information representation were related to the messages that they intended to communicate with audience: That is, both of the students' different degrees of genre awareness and distinctive modal choices were influenced by the extent to which they considered their audience thoughtfully. In theses project display boards, the messages were carried by different types of design (layout structures), multimodal patterns (elements of information representation), and consideration of audience (elements of communication). Table 2 presents the features of three distinctive multimodal text de-

Table 2. An overview of students' multimodal design patterns identified in this study

	Incoherent text-image design: Emergent authors	**Text-embedded image design: Conventional Authors**	**Image-embedded text design: Developing authors**
Design of layout structure	Disordered structure Segmental structure	Top-down structure Sequence-oriented structure	Spatial structure Inferential composition considering layout as a whole Individualized composition
Patterns of multimodal representation	Using drawings or images to represent the topic Decoration-oriented	Using writing conventions Using drawings or images to complement the contents of sub-topic Consistency of color use Visualization using numbering or various font size and color	Using drawings or images to complement or amplifying the contents of sub-topic Theme-related color use Visualization using various font size, the theme-related design patterns and color
Audience and communication	Intuitive composition using eye-catching elements (e.g. arrows, lines, or speech bubbles)	Formal composition using linear and sequential elements (e.g. paragraphing, numbering, and bulleting)	Interactive composition using theme-representing layout design

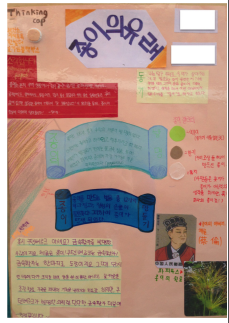
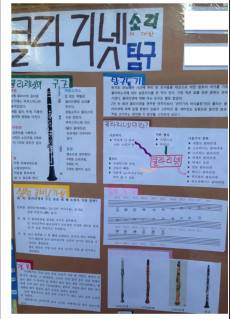
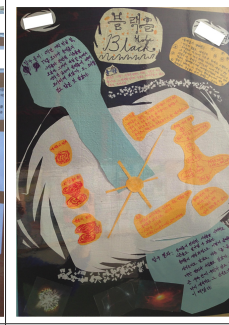
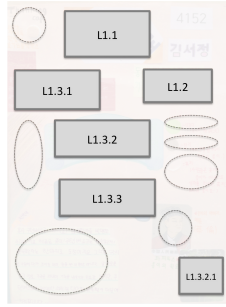
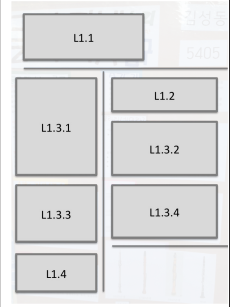
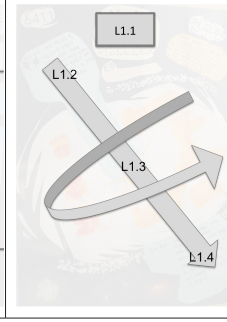
	Incoherent Text-Image Design *(Emergent Authors)*	Text with embedded Image Design *(Conventional Authors)*	Image with embedded Text design *(Developing Authors)*
Original display boards			
Complex area models			

Figure 1. Examples of elementary students' display board designs in this study

sign and the author characteristics identified in this study: (1) incoherent text-image design by emergent authors, (2) text-embedded image design by conventional authors, and (3) image-embedded text design by developing authors in multimodal composition.

Additionally, Figure 1 exhibits representative examples for the three design patterns and the identified complex area models. In the following subsections, we describe in detail each of these patterns using the examples.

1. Incoherent Text-Image Use: Emergent Authors

Incoherent text-image design is the least sophisticated pattern

found among the analyzed display boards. The student authors of this naïve pattern tended to take information from their research report and use it in an unorganized manner, while placing an overemphasis on unimportant information. They seemed to be inconsistent in using texts and images, without rules or principles, showing less capacity to organize information spatially. Although it is evident that these students used multimodal tools, the modes basically were used for aesthetic purposes but not for meaning representation purposes. Thus, these students seemed not develop a level of modal awareness yet in relation to what different modes can afford toward their goal achievement.

As the first example in Figure 1 shows, the structure of the layout was disordered and segmental. The layout units were scattered and main chunks of information were distributed ill-proportionally: Too much information was located in the center of the space. As the circular shapes with dotted lines in the complex area model indicated, the author seemed to put irrelevant information together into their layout unit. For example, with the topic of the display board was the origin of paper, the student author included information that is not directly relevant to the topic, such as a story of Gutenberg who invented the technology of typography and printing. Also, the student spontaneously made one part of her display board as the gallery of paper that explains the various types of paper such as colored paper and toilet paper that are neither related to her topic nor included in her research report. The authors of this group less considered the structure of the layout prior to their production of display boards. Rather, they randomly organize the layout units, and, as a result, they were not able to efficiently use the space to develop semantically coherent layout units. This ill-structured design resulted in the lack of consistency and coherence.

In terms of multimodal tool use, emergent authors seem not to be ready to adequately represent the important content of their display board in part because their incoherent use of texts and images. Most

images or drawings were ineffectively used to complement or stress particular textual information. Images and drawings often were chosen by personal preferences, but not by their discretion in relation to effective meaning representation. This naïve use of visual modes and elements indicates that the students in this group may be unfamiliar with the genre of display board. As a way to consider the audiences, they used rather explicit images such as arrows, lines, or speech bubbles to guide the reader.

2. Text-Centered Image Use: Conventional Authors

The second type of student authors appeared to prefer to use conventional mode of writing. These authors used print conventions dominantly, chose to take relatively formal approaches to presentation, and emphasized written texts over visual modes. They were aware of role of the modality assignment and sign-making, but the genre features of their display boards were not completely transformed from the written report.

The structure was similar to that of print conventions; top-down and sequential structure. The complex area model of the second example in Figure 1 is a typical example of conventional authors' display boards. Regardless of their topic, students used square boxes to make a division between layout units with one clear vertical grid in the middle of the display board that seems alike to their research report. For instance, even though the author of second example in Figure 1 researched the sound of clarinet with the unique experiment that he designed and conducted by himself, he did not try to reconstruct his process and result of research into the genre of display board but copied and pasted the same contents from his report. As a result, he might have achieved the goal to deliver every content from his research report, however, he could not utilize the layout structure to deliver the important content in visually effective way that the genre of display board is expected to be. This happened to most of

students who showed the text with embedded image design.

Regardless of their lack of awareness of genre, they were able to visualize the consistency among text boxes, images, and graphics using fonts and colors that cohered to each other. These students knew that there are different kinds of modes that they can use in cohesive way. Even though teacher gave them a freedom to choose between handwriting and printout, most of them preferred to use printouts both for the texts and images. They used bold face, underline, or various colors to distinguish the titles and indicate important parts using word-processor on computer. In addition to that, the students utilized limited images to complement the contents of the texts to focus more on the delivery of all contents. It explains that they are more familiar with the genre with written text so their multimodal text composition could not go beyond the written form. They used numbering and bulleting to have audiences read in a suggested order like they did in research reports. This formalized presentation may seem neat and formal, however, it limited students' creativity as designers.

3. Image-Centered Text Design: Developing Authors

Student who showed image with embedded text design composition were mode-friendly authors and they designed their display boards in creative way. Their consistency was in their imaginative image use that are well organized and that help the audience interact with their display boards easily. Also, they summarized the important content information so that only the gist of their research reports can be presented in the display boards.

The layout was the core of their display boards; they visualized their topic using theme-related images. Developing authors' unique layout can be seen in the third example in Figure 1. As seen in the example, the student used the image of 'black hole' as his layout structure. While he made his unique layout, he organized the layout units over the page, coherently and intertextually. Developing

authors' choice of representative image made their multimodal design consistent. Also, their design was an audience-friendly composition. Their display boards can be recognized at a glance what those are about because of their consistent structure design. They chose one representative concept that can represent their topic to design their layout structure. It shows their ability to organize their information within the concept more creatively and imaginatively. For making this composition possible, every layout unit, image and color should be coherent and be planned well before hand. Unlike other students who showed incoherent image-text design and text with embedded image design, they were only students who drew sketch of their layout structure before they start to create on the board. Interestingly, all of four students did not use printouts for text. They handwrote on the display board because they did not use the exact texts from their research reports, instead they organized their layout structure first and wrote down what is important in allowed space.

Moreover, the students who created image with embedded text design used various modes with the intentionality that is related to their design. They utilized images to complement or amplify the contents of text, recognizing and realizing the affordances of image as a design component. Also, they used drawings or images as a decoration of their design to make their design more sophisticated and authentic. For example, in the third example in Figure 1, student put dust-like pieces of white paper around the edges of black hole and drew the explosion image at the middle of the black hole to give more detail to represent a black hole.

Lastly, their display structures were spatial and open in a way that the topic can be immediately recognized to readers. They attracted audiences' attention to different degrees and allowed them to decide how to interact with their display boards. This is because they tried to make meaning using semiotic modes that are the socially constructed. It led the successful interaction and interpretation between the writer and readers.

4. Developmental Trend Across the School Grades

As shown in Figure 1, students can be characterized with three distinct authors of multimodal composition. The student distribution of these three authors is as shown in Figure 2.

Most of the fourth grade students (n=107) show incoherent image-text design, however the number of students who showed that design sharply decreases from fifth grade with a small number of fifth (n=21) and sixth graders (n=20). Most of fifth (n=124), sixth graders (n=112) and a small number of fourth graders (n=37) showed text with embedded image design composition. Lastly, a small number of sixth graders (n=4) demonstrated image with embedded text design composition. Even though we found three authors' profiles, most students stayed in the text with embedded image design. What we have to notice from this graph is why there is a sudden change from incoherent image-text design to text with embedded image design between fourth grade and fifth grade.

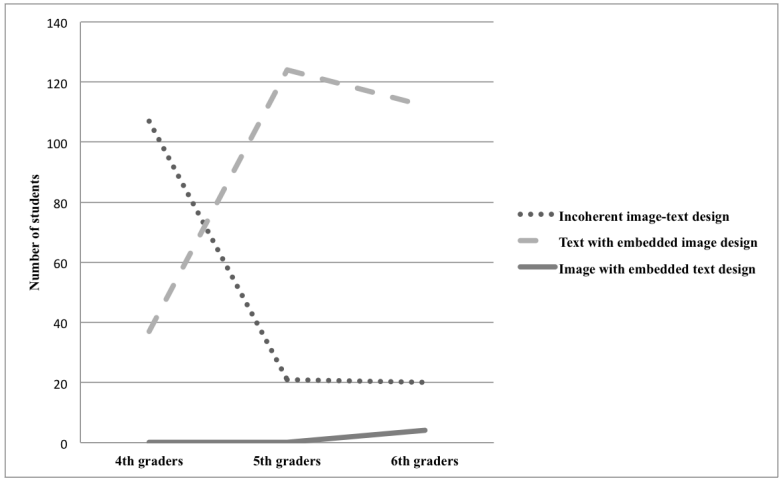


Figure 2. Student distribution in multimodal literacy practice in this study

V. Discussion and Conclusion

By analyzing the data of elementary school students' multimodal text composition, this study described how students perform meaning making with various multimodal features. Students' multimodal text composition in this study was interpreted by three different components: design (layout structure), multimodal patterns (elements of representation), and consideration of audience (elements of communication). The concept of design and genre can be a central to multimodality because it emphasizes the social interactions and communication that reflects students' identity or intentionality in composing multimodal texts (Kress, 2003; Kress and Van Leeuwen, 1996). Also, it shows students' awareness of what is to be presented, for whom, using semiotic resources available to them. As a result of this study, three authors' profiles in multimodal literacy practice were uncovered: Incoherent image-text design, text with embedded image design, and image with embedded text design. This results showed that multimodal literacy can be developed and taught as children grow, however, most students were staying at the text with embedded image design level. We can assume two reasons what caused these results.

To begin with, upper grade students in elementary school are more likely to focus on reading and writing text-centered texts at school and at home. Fourth graders or lower grade students are more interested in and read the children's picture book or informational comic book more often than upper grade students. They are encouraged to be friends with books regardless of its forms. However, as they become the upper graders, the recommended books or textbooks are more of written texts, and they are taught to write formal types of texts with print conventions. These text-centered concentrations in reading and writing at school and at home can make students limit their ability to develop themselves as creative multimodal authors.

Secondly, there is a lack of learning opportunity for students to

learn how to utilize the different modes in the creation of text in new genre. Even though they often have chance to make multimodal texts, there is not enough teaching for how to make multimodal texts with using various modes. Also, often times, teachers give students tablets or computers to make new types of texts without teaching them the differences in mode choices for sign-making depend on the genre. Therefore, even if teachers give them a creative multimodal text composition task, students have no choice but stay more in the text-centered level.

Even though this study explained elementary students' meaning making in designing multimodal text, there are few limitations in this study. First, this study only targeted elementary school students within one school, so it cannot be generalized. Secondly, students chose the topics of their research so every student had different topics. Therefore, it cannot be explained whether the multimodal text composition is a domain general practice or domain specific practice. There is a possibility that students' multimodal text composition could have been different if they had different topics. Third, there were materiality constraints in this study. If they could make their display boards with different tools, especially digital tools such as computer and tablet, then the result might have been different. Materiality can make a difference in composing multimodal texts.

Nevertheless, the study has multiple implications for theory, research, and practice. First, this study supports our ongoing understanding of students' multimodal literacy practices. Findings from the classroom-based data can explain how students actually use various modes to make meaning. Second, this study calls for attention to the developmental perspective of multimodal literacy. Findings from this research suggest the possibilities that multimodal literacy can be developed and socialized as children grow as writers, and therefore it is necessary to understand children's multimodal literacy practices from a longitudinal perspective. Third, this study will eventually inform effective curriculum, instruction, and assessment of multimodal writ-

ings. The majority of the students in this study tended to be text with embedded image design using print conventions. Students should learn to choose suitable medias and to utilize images as forms of meaning representation for communicating in the new literacy world. Therefore, teachers should teach how to utilize images and design elements effectively to construct and convey the message. Nevertheless, as other researches suggest, there is still much to do in recognizing and assessing the communicative affordances of modes and media used by students.

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ABSTRACT

Exploring the Design Patterns That Elementary School Students Use to Create Multimodal Display Boards in a Classroom Project

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The goal of the present study was to examine the design patterns of multimodal information representation that elementary students used to create a project display board, and to gain insights into their emerging identities as multimodal text authors. The study was conducted at an elementary English dual-immersion school located in an urban city, Korea. Year-long inquiry-based instruction was offered for the entire body of fourth- to six-grade students. Students created their own project display boards as the culminating product of their inquiry learning, which were collected as the data for the examination of multimodal design patterns. Descriptive data analysis was conducted to identify the array of design elements, features, and layouts used in the display boards and to classify these student authors according to their different multimodal engagement. The analysis resulted in three related but distinctive profiles of student authors, including (a) emergent authors mainly using images for aesthetical purposes, (b) conventional authors using written text as the dominant mode of information representation, and (c) developing multimodal authors integrating written texts and images into a spatial framing of messages. The result indicated different stages of multimodal literacy development with respect to use of design features, genre awareness, and audience consideration. Implications are discussed in relation to literacy research and practice.

KEYWORDS Multimodal composition, Multimodal design, Genre knowledge, Audience awareness, Elementary literacy