SAGE researchmethods cases

Case Study: Developing a New Method for Analyzing Data from Visual Artwork

Abstract

In 2011, Donna DiBartolomeo and Zachary Clark enrolled in the Arts in Education Program at Harvard Graduate School of Education. Harvard Graduate School of Education is home to Project Zero, an educational research group comprising multiple, independently funded projects examining creativity, ethics, understanding, and other aspects of learning and its processes. Under the guidance of Principal Investigator Howard Gardner and Project Manager Katie Davis, the authors were tasked with developing a methodology capable of observing fine-grained, objective detail in complete works of visual art. The data that emerged from this process were included in the Developing Minds and Digital Media project, which sought to identify changes in adolescents' development (specifically, imagination, intimacy, and identity) through a mixed-methodological approach. This article will explore the process of developing a new visual research method, which produced an 18-point coding scheme that observes fundamental attributes of visual artwork without a subjective lens. The objective design of this method allows the coding scheme to be implemented in a variety of contexts, including research projects and practice-based investigations.

Learning Outcomes

By the end of the case, students should

- Possess a more nuanced understanding of challenges involved in developing a new methodology
- Understand the importance of conducting research in the full range of aspects of the discipline (art practice, art history, and art criticism)
- Be able to examine visual objects produced in any setting through the lens of any discipline
- Recognize the pros and cons of using this method to assess a portfolio of work to answer a specific research question
- Understand the role of inter-rater reliability in objectively coding traditionally subjective content

Project Overview and Context

The Developing Minds and Digital Media Project (DM2) is a multilayered, mixed methods research initiative that investigated the degree to which the advent of the digital media age, and the subsequent proliferation of virtual platforms, influenced the social and personal development of young people. The research was conducted at Project Zero, an educational research group at Harvard Graduate School of Education. Led by Principal Investigator Howard Gardner and Project Manager Katie Davis, the study explored the ways in which accessible

digital culture affects adolescents today, with an emphasis on identity, intimacy, and imagination (Gardner & Davis, 2013). The DM2 research team pursued this investigation through focus groups comprising youth development practitioners, 40 in-depth interviews conducted with teachers, and an analysis of secondary data sources that included more than 50 samples of fiction writing and 414 visual productions made by youth over a 20-year period. The literary and visual samples captured ideas and experiences through creative productions. Collecting data from these sources required methodological tools that could record detailed information through an unbiased lens.

Identifying a methodological approach designed to capture data in visual artwork that could be used to observe trends across the sample set proved to be a challenge that emerged in the early stages of the DM2 investigation. As the researchers assigned with the task of capturing data from a large portfolio of artistic productions, we thoroughly explored existing methodologies for collecting data from visual work. We found that existing approaches were largely subjective in nature or were designed with a specific assessment in mind. Confident that a wholly objective methodology did not exist for capturing technical and content-based information from visual work, we developed a novel approach for coding information from artwork in fine-grained detail through an objective lens. The purpose of this article is to describe the process through which this approach was conceived and ultimately applied, focusing on the challenges, successes, and potential future implications for this methodology.

Research Overview: Literature Review

While there were several precedents in the existing literature, we quickly identified the need to develop something completely new. Existing methods used to analyze art, especially youth-produced artworks, were designed to interpret the intent of the artists, assess their knowledge or ability, or understand their psychological condition. For example, informal learning expert Rob Bowker studied children's drawings before and after an educational field trip to a simulated rainforest environment in an artificial biodome in Cornwall, UK. He developed a methodology to interpret the pre- and post-visit artworks to assess change in the children's learning and perception of the content presented at the field trip site. This method looked at the drawings holistically for evidence of learning in a specific subject matter and did not isolate artistic and content attributes that would allow for study of the artwork itself.

Likewise, science educators Darius Kalvaitis and Rebecca Monhardt studied children's understanding and engagement with the natural world by analyzing children's drawings of their personal experience outdoors. The method used to analyze these artworks included determining whether the children visibly illustrated a relationship with the natural environment

by depicting this connection in their artwork. We identified that this method could not work for our study because it focused on capturing data related to a very specific research question and did not separate or isolate individual content or technical attributes in the drawings, which we required for our unbiased analysis. The DM2 study required a tool that would objectively observe visual data, rather than assess the data according to a predetermined objective or research question.

Other methods used artwork to find evidence of learning or to illustrate proof of concept in a teaching strategy. Daniel Shepardson, professor of geoenvironmental and science education at Purdue University, and his colleagues used a 'draw and explain' assessment instrument to identify whether students understood climate change. Gathering qualitative data from drawings produced as a response to the prompt served as a controlled data set for Shepardson's study, but the data did not provide information about the artwork itself or how it was executed from a technical or materials perspective. Additionally, the interpretive data were coded holistically so that individual content could not be extracted and analyzed. Shepardson also collaborated with colleagues on other studies, employing this method to look for student's comprehension of greenhouse gases, watersheds, as well as general environmental knowledge across age groups.

Jon Prosser, a University of Southampton researcher interested in the use of images to inform qualitative research and editor of *Image-based Research: A Sourcebook for Qualitative Researchers*, made a case for using images more widely in qualitative investigations. While the sourcebook includes numerous examples of how images can be utilized in research studies, the examples were grounded in anthropology, sociology, and psychology, which inherently attempt to interpret and understand the human condition, intention, and interpreted significance. The examples, while compelling, were designed to serve particular agendas and could not be utilized to analyze the DM2 data.

In another visual arts research investigation, University of Oxford anthropologist Marcus Banks coded for subject matter and specific content by identifying the narrative embedded in each work. While the subject matter of each artwork is something we also identified as an essential attribute for providing a complete picture of the artwork in a detailed coding memo, interpreting the narrative contextualized the data in a way that was too subjective for the purposes of our study. By recognizing the need for codes that capture this information while maintaining an objective position, we designed the coding scheme to capture holistic information at the end of the coding process to ensure that it was informed and filtered through the new system of extracting unbiased, physically visible, specific data.

Finally, a classic example of the use of visual artwork in research is the Draw-a-Person test developed by Florence Goodenough in 1926 and modified by Dale B. Harris in 1963. Study subjects were prompted to create a figurative drawing, and the results were analyzed to determine the psychological condition of the artists or to measure their intelligence. This method collected a large amount of data from the artworks, focusing on 14 aspects of the drawings, with 64 codes and subcodes for each artwork. While the extensive data set shows rigor in recording detail, the interpretive lens renders this method ineffective for our study.

Our study was an investigation of independently developed artworks created over time, providing a sample set that would allow us to look at the works in an objective way without attempting to recreate knowledge of the artist's intent or condition. We needed a method that was not holistic or prescriptive. We did not want to approach the sample set with an agenda; rather, we wanted the data derived from the actual artworks to speak for itself.

Development of Coding Scheme

As discussed above, existing methodologies for observing data from visual artwork did not suit the purposes of the DM2 study, which sought to uncover information embedded within visual productions through an unbiased lens, focusing solely on collecting the visible information without an interpretive agenda. We were not interested in assessing the condition of the artists or evaluating the content of the works they created. We were looking to observe changes over time rather than determine a judgment of quality or form; for this reason, we were compelled to develop our own methodology.

A preceding component of the DM2 study was the investigation of 50 works of fiction by teen writers over a 20-year period. When we joined the study, the coding scheme for the literary component was already developed. The literary coding scheme included codes that observed isolated attributes of literary work, including 'genre' (e.g. realism or fantasy), 'tone' (past, present, and mixed), 'structure' (linear and non-linear), and other fundamental literary attributes. Researchers then applied the coding scheme to the sample set, which comprised works from two teen literary magazines.

We used the existing literary coding scheme as the basis for the early stages of our visual art coding scheme, adopting codes that were also relevant to visual work such as 'genre' and 'tone'. However, it became clear that the literary scheme could not be directly drafted into a visual coding scheme. For example, codes such as 'structure' would not yield useful information about visual artwork because the structural elements of visual productions are inherently different from those of literary works. With this in mind, we sought to identify codes

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that were more aligned with visual work. Whereas 'structure' might reveal important attributes in a written piece, details such as 'composition' and 'medium' were more appropriate for mining visual data. Guided by this knowledge, we drafted an initial coding scheme based on (1) the codes that could appropriately be drafted from the literary scheme and (2) additional visual-specific codes drawn from our background in art history, education, and practice.

The development of the coding scheme was an iterative process. We began by conceptually dismantling a completed artwork into its elemental parts. Once we felt confident that we had constructed a coding scheme that included a comprehensive breadth of codes, we piloted the scheme on a series of visual productions. Through this process, we noted additional attributes that had not been included in the initial coding scheme draft but, due to the frequency with which these attributes seemed to emerge in the pilot works, would be necessary to include in a revised version of the coding scheme. These additional attributes included codes such as 'use of light', 'reference to historical artwork', and 'background'. After discussing the relevance of these notes, we redrafted the coding scheme to include the additional codes, which produced a 17-code scheme. Of this list, 14 codes were identified as technical, observing attributes that describe the technical execution of the piece (i.e. the way in which light is used, the rendering of the background, the choice of medium). The final three codes were content specific, which refers to the content that the piece conveys (e.g. its tone and the particular theme that the artist explores).

After employing this second draft coding scheme, we were content with the degree of nuance that the scheme was capturing from the visual productions. In short, the coding scheme was working successfully by breaking down a holistic work of art into discrete and elemental pieces of information. This was the unbiased method we sought—uncovering information that was evident within the piece without an interpretive lens or core prompt. Shortly thereafter, however, we recognized the need for a final, comprehensive code that would serve as a characterization of the piece. This code, which we called 'stylistic approach', would draw from the preceding 17 codes to determine an at-a-glance observation of the piece with limited classifications that included 'conservative' (productions that were similar to traditional works produced in an arts classroom), 'neutral' (non-traditional yet non-transgressive work, such as sketches of family or pets), and 'unconventional' (conveying a political or social message or using unusual materials to execute the piece). We felt confident that this code would serve as an informed summary of the 17 codes that preceded it. Once this final code was in place, we considered the coding scheme complete for the purposes of the DM2 study and went forward with coding the sample set.

As trained researchers, we implemented the coding scheme from an informed perspective, with

an additional researcher (Katie Davis, Project Manager on the study) coding during the pilot period to ensure that the coding scheme was implemented in a consistent manner. Once the three individuals agreed on the code definitions and their implementation, the project moved forward with the two primary coders. We each coded all of the 414 pieces, alternating between first-pass coding (the initial coding of the piece) and shadow coding (the follow-up coding). By coding the work this way, we ensured that inter-rater reliability was in place. Inter-rater reliability refers to the degree to which researchers agree on findings. Peter Smagorinsky, University of Georgia research professor, underscores the importance of high inter-rater reliability in order to ensure accurate data in his work to improve the reporting of analytic methods. The first-pass and shadow-coding approach implemented in the DM2 study adheres to this precedent. When discrepancies arose between our coding memos, we discussed the code in question and used evidence from the artwork to reach consensus on the appropriate notation.

Research Practicalities

The visual artwork portion of the DM2 research investigation was executed between September 2011 and May 2012; however, the methodology development continued through May 2015 when a comprehensive methodological summary was published in the peer-reviewed journal *Visitor Studies*.

Sample Set

While the coding scheme was in development, DM2 was fortunate to have access to a rich sample set through the archives of a long-running publication based out of Newton, MA. *Teen Ink*, a national magazine dedicated to showcasing youth visual and literary artwork, has been in existence since 1990 (in regular publication for 21 years at the time of the DM2 study). We identified this as an ideal sample set for three primary reasons: (1) the publication was run by two editors over the course of the two decades, ensuring a consistent editorial eye; (2) because *Teen Ink* focuses on adolescent artwork, we were able to ensure that the sample set fits within the target demographic of the DM2 research study; (3) *Teen Ink* maintained the original versions of all visual art submissions, enabling us to code directly from original artwork as opposed to reproductions within the publication itself (Figure 1).

Figure 1. Example of adolescent artwork from the DM2 study. From Art Gallery, Teen Ink magazine, October 2007, p. 34.

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Source: http://www.teenink.com/Issues/2007-October.php.

Description: An Art Gallery of 10 images in *Teen Ink* magazine. Images include a range of color palettes and media including drawing, painting, and photography. Artistic 'genre' represented

includes portraiture, landscape, cartooning, still life, and abstract imagery.

The unique focus of the DM2 study involved determining the changes in adolescent artwork across a period of time. From the archive of the *Teen Ink* publication (1990-2011), we determined two primary sample sets: 177 from the early period (January 1990-December 1995) and 177 from the late period (January 2006-November 2011). Sixty pieces from a middle group (January 2000-December 2001) were coded as a control group. Each issue of *Teen Ink* included a dedicated 'Art Gallery' page that contained 8-10 visual art images from a variety of disciplines. In order to ensure a random sample set, we assigned a number to each of the images and entered the numbers into a random integer generator online, selecting three randomized images per gallery page.

Prior to September 1999, each issue of *Teen Ink* was printed in black and white. Due to the relatively low print quality of earlier issues—which limited the amount of observable detail in each piece—original pieces were collected from the *Teen Ink* archives for the analysis of works prior to 1999. If an original artwork was not available, selections were re-randomized from the available originals in the archive. Approximately 35 pieces (<10% of the sample) were ultimately re-selected because of this situation. The final 414 piece sample set included pieces selected from 59 different issues of the publication across the 21-year period.

Implementation of Method

This method could be used in empirical and longitudinal studies involving visual works. For example, this method could be applied in classrooms to help teachers understand the results of their teaching and curriculum design over the course of a school year or through the duration of a particular program. It can follow students individually or provide data to investigate school populations collectively. The possibility to inform practice is strong since portfolio-related data can be analyzed to promote change and improvement in teaching methods and provide substantial evidence to inform arts programming in schools.

This method can also be applied to inform practice in the informal learning field. Museums, after-school programs, and community arts venues may use this method to assess art production programs, understand visitor engagement, investigate collections, and evaluate audience participation. Museums may find this method of particular interest. Visitor studies and museum education experts John Falk and Lynn Dierking found that immersive sensory experiences promote visitors' connection with exhibition content. Producing artwork during programs and in response to gallery visits, as part of the informal learning experience at museums, can increase visitor engagement. Using the method outlined in this case study,

researchers can determine the best format for providing art-making experiences in these settings.

'Method' in Action/Findings

Interesting findings from this study were highlighted in the detailed data captured by specific codes. It is in these findings that we see the necessity for developing this new method. For example, we coded for 'background rendering', which is an isolated technical attribute of the works. In this code, we found that 38% of the early artworks were produced with a 'blank' background. The data that make this finding significant are that 78% of the works created in the late period were coded to have a 'fully rendered' background. This increase in 'fully rendered' backgrounds, along with our analysis of the other 18 codes and the review of the relevant literature, led us to conclude that the artwork was becoming more professionally executed in the later works (Figures 2 and 3; Table 1).
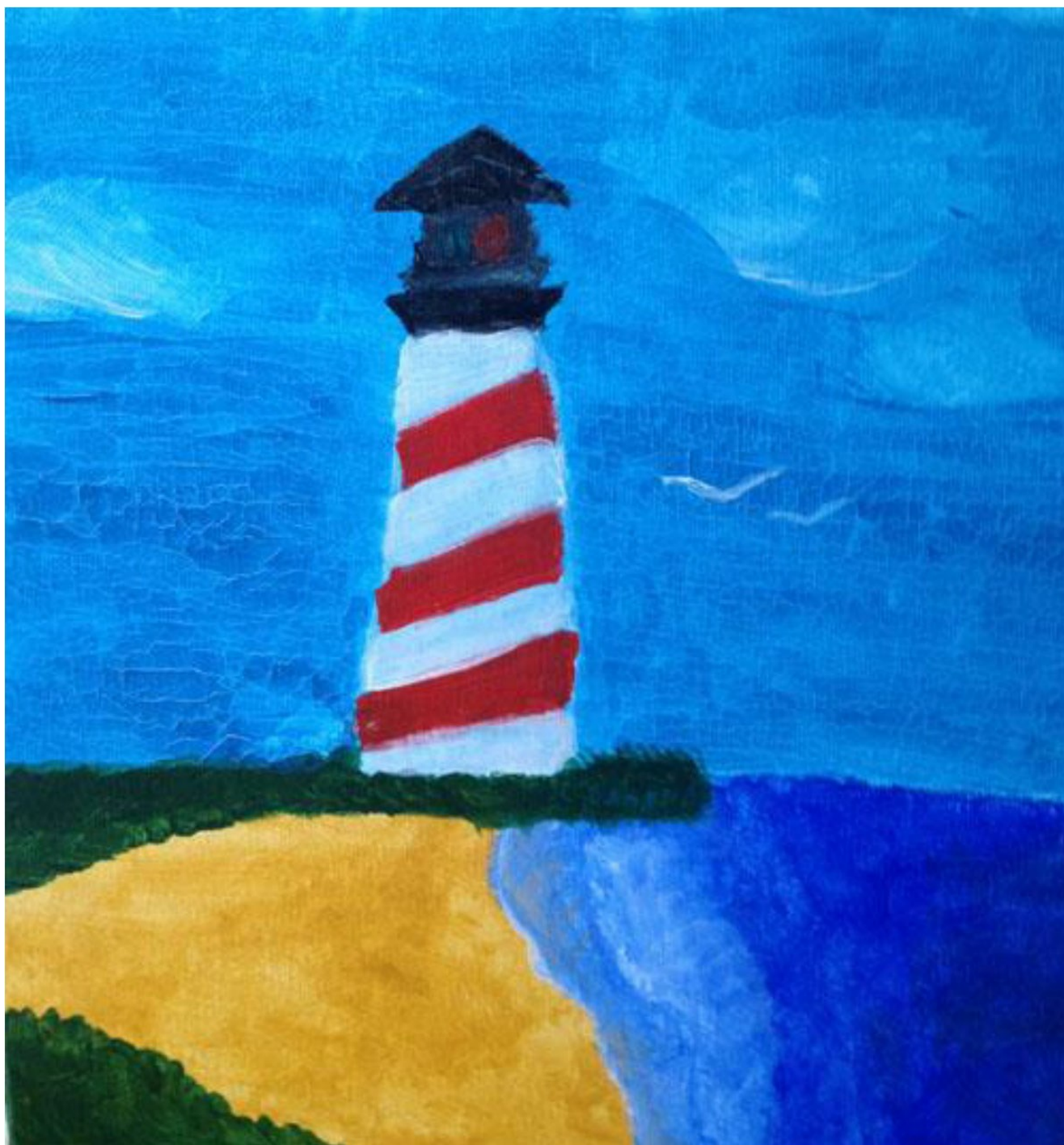
Figure 2. Example of teen artwork (artist: Keily L. Hernandez).

Description: A contour line drawing of a human hand on a white page. The 'background' is

blank.

Figure 3. Example of teen artwork (artist: Joanna Meyer).

Description: A painting of a red and white striped lighthouse. Blue sky with clouds and seagulls, sea grass and a sandy beach, and a body of blue water complete the image. The 'background' is fully rendered.

Table 1. Selection of findings: DM2 research study.

Findings: background rendering

	Early (1990-1995)	Late (2006-2011)
Blank	38%	8%
Partially rendered	12%	7%
Fully rendered	49%	78%
Single color	1%	6%

Description: DM2: Developing Minds and Digital Media Project.

Recent works are more *fully rendered* and *complete* than works from the early period. The results of the analysis of data collected with the visual art coding scheme and method developed for the DM2 study are shown. These findings are for the 'background rendering' code. Recent works are more fully rendered and complete than works from the earlier period. The table shows the following results from the early period (1990-1995): blank 38%, partially rendered 12%, fully rendered 49%, and single color 1%. It also shows the following results from the late period (2006-2011): blank 8%, partially rendered 7%, fully rendered 78%, and single color 6%. In particular, it draws attention to the comparison of early and late results for blank and fully rendered for both periods.

Another significant finding was derived for the 'medium' code. We found that a majority early artworks (56%) tended to be made with 'pen and ink', 'drawing', or a combination of the two media. Later works were only coded in these media at 18%. What made the analysis interesting is that the codes for other media, including alternative art forms and mixed media, rose to 65% of the artworks in later years.

'Theme' also generated interesting data. This code requires some level of interpretation, which is why researchers using this method should be trained in visual art practice and art historical context. Due to the position of 'theme' in the coding scheme, any necessary interpretation was influenced by the previous 16 codes. The previous codes listed data that were visually present in the artworks, thus limiting bias. 'Theme' produced some surprising and idiosyncratic results, including the unexpected consistency of certain thematic content over time and the change in the representation of other themes. Artworks depicting 'identity' and 'self', as well as 'imagination' and 'fantasy', were identical across the entire sample set. Significant changes

were noted in the categories of 'isolation' and 'solitude', as well as 'nature', with a notable increase in the occurrence of both thematic codes. Artworks themed with 'animals' and 'pets' were consistent with an identical occurrence of 11% of all artworks coded. We found that this particular finding indicated a certain balance between the dramatic shifts in thematic content in adolescent art productions with the persistent occasions of artwork containing familiar themes.

Benefits and Future Implications

The primary benefit of our coding scheme is that it enabled us to draw out information without a subjective lens and without an implicit or explicit agenda. The 14 technical codes capture isolated aspects of the piece that rely on visual evidence, that is, the codes are designed to observe only what is visible within the artwork without attempting to interpret the piece. The final four codes, while content specific, rely on the preceding technical codes to provide evidence that informs the responses to 'tone', 'symbolism', 'theme', and 'stylistic approach'. By adhering to objective data in this way, the coding scheme serves as an instrument which translates a holistic visual image into disaggregated data.

Another critical benefit of breaking down a complete visual piece into discernable, fine-grained information is the ability to cross-reference codes at a researcher's discretion. That is, it is possible to compare the 'use of light' across specific codes in 'medium' or compare the 'stylistic approach' of all two-dimensional artworks versus the 'stylistic approach' of all three-dimensional pieces. The opportunities for nuanced cross-referencing are vast, offering researchers and practitioners a tool for observing specific trends with a single set of comprehensive data.

Challenges

Challenges to the success of implementing this method could stem from the time required to establish a common vocabulary between the researchers conducting the coding and the availability of a suitable sample set to conduct the study. Both of these challenges can be overcome through thoughtful design of the individual study. Taking time to train researchers in the technical and content-based codes, with attention to art history, art practice, and cultural context, will alleviate issues and ensure inter-rater reliability. Applying the method to a suitable sample set will require careful development of an appropriate research question, and the selection of a sample set will provide the necessary insight to answer the question. For example, a portfolio of artworks may be compiled over extended periods of time for longitudinal studies, or bulk portfolios may be produced simultaneously to assess programmatic curricula across contributors. While challenges exist, the benefits of utilizing this method lie in the ability to collect and analyze unbiased data from a large number of visual works.

Conclusion

This method is a novel approach to collecting data from visual artwork. The coding scheme allows researchers to isolate specific aspects of a visual production and creates a comprehensive record of the visual work. Individual attributes and qualities are isolated and preserved in the data set and can be analyzed, cross-referenced, or examined under new criteria or research questions. The unbiased perspective of this method could not be achieved through existing methods. Existing methods largely relied on interpretation of art pieces as a whole or approached data collection with a prescribed agenda. By recording objective, granular data from each work, our method is capable of creating a comprehensive record of massive amounts of visual information while preserving unbiased details about each artwork. Essentially, the coding scheme provides a 'picture' of the artwork in the form of data, making analysis possible.

This method is applicable across contexts, inquiries, and data sets. Museum researchers, art instructors, program designers, and art practitioners may find this method useful in their work. The coding scheme is effective in gathering data for a wide variety of studies as it is currently published in *Visitor Studies*, and adaptation may be minimal for some investigations. If a research question requires more detail or specific vocabulary for a particular code, the coding scheme can be adapted to suit the research initiative, while maintaining the objective intention of the original coding scheme. We are confident in the potential for this method to provide a framework for data collection and analysis in visual research and studies that include visual productions in their investigations.

Exercises and Discussion Questions

1. In what other contexts might objective data collection from visual information be useful?
2. What might be revealed from cross-referencing elemental codes that cannot be observed from holistic assessment? What are the opportunities and/or limitations inherent in the process of breaking down completed works into isolated pieces of information?
3. Our methodology seeks to capture information through an unbiased lens. In what ways might a coding scheme like this incorporate subjectivity? What benefits might this engender? What limitations?
4. Can you think of other approaches to the DM2 research question that might enable researchers to assess trends within visual productions?
5. How might this methodology be adapted for non-visual work, as in movement or sound-based productions?
6. Considering its intentionally objective nature, in what ways might this approach serve

institutions that approach assessment with explicit objectives/goals in mind?

Further Readings

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Web Resources

Project Zero: The Good Project (http://www.pz.gse.harvard.edu/good_project.php)

Teen Ink Magazine (http://www.teenink.com/)

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