

CHAPTER III

RESEARCH METHODOLOGY

This chapter consists of an explanation of the research methodology. It covers research questions, research method, and research procedures (including data collection, data analysis, and data presentation).

3.1 Research Questions

The present study investigated the use of images and how they are ideationally related to the verbal text in the form of captions in the Chemistry textbook. This study is geared towards answering the following research questions:

1. What types of images are used in the textbook?
2. What types of processes do the pictures use to communicate science in the textbook?
3. How do the pictures ideationally interact with their captions in communicating the science?

3.2 Research Method

This study employs a descriptive qualitative research design. Qualitative research design allows researchers to analyze the data in their natural settings, and attempt to make sense and interpret the meanings of the data in various social settings (Denzin & Lincoln, 2005). A descriptive study is designed to describe the distribution of one or more variables without regarding the causal or other hypotheses (Aggarwal & Ranganathan, 2019). It also relies on observation as a means of collecting the data, in order to examine what can be predicted to happen again in the same circumstances (Walliman, 2017).

With regard to the descriptive qualitative research design, the present study applied multimodal analysis or multimodality. According to Hermawan (2013) multimodality includes a procedure to analyze texts that use more than one semiotic modes, specifically those that use verbal and visual modes at the same time. Multimodality aims to see how the verbal and visual modes are combined to create a meaningful whole (Kress & Van Leeuwen, 2006). Therefore, multimodal analysis is employed in this

study to find the ideational relation between the images and the captions accompanying them in communicating the science.

3.3 Research Procedure

The data for the research are in the form of visual and verbal data. The visual data for the research are in the form of images taken from the first six chapters of a Chemistry textbook used in International Program of Science Education (IPSE) study program at UPI. Meanwhile, the verbal data are in the form of verbal captions that accompanied the images in the textbook. Visual transitivity system based on Kress & Van Leeuwen's (2006) theory of reading images has been used to find the process used by the images to communicate the science, along with the elaboration on the types of images proposed by Dimopolous et. al. (2003) in order to find the types of images presented in the textbook. Verbal transitivity system based on Halliday's (1994) systemic functional grammar has been used to analyse the captions. The result of verbal and visual analysis is used as a base to uncover the ideational relation between the two modes.

3.3.1 Data Collection

The data for this study is in the form of visual and verbal taken from a chemistry textbook used by the students majoring in International Program in Science (IPSE) UPI. Among the other science textbooks used by the IPSE students, a chemistry textbook is chosen because it uses more images than the other science textbook.

This study analyzed 127 images and the captions accompanied them. The images and the captions were taken from the first six chapters of the Chemistry textbook. The research analysed 127 images and captions because the number of sample images and the captions taken are sufficiently representational of the pattern of the whole scientific concept of the Chemistry textbook.

The verbal and visual data are collected by screenshotting the images and the captions accompanied them from each chapter.

3.3.2 Data Analysis

This study follows Hermawan & Rahyono (2019) procedure of analyzing multimodal text, namely science textbook, which involves visual and verbal semiotic modes. The procedure is modified based on the needs of the present research. The data from the selected images were broken down into the elements of visual and verbal following the work of Kress & Van Leeuwen (2006) and Halliday (1994).

First, the analysis was conducted on the visual data. The images were analyzed in term of their types. Kress & Van Leeuwen's (2006) theory on types of images as used by Dimopolous et. al. (2003) has been used to achieve this. Next the images were analyzed in terms of who or what their participants are, and the process and the circumstances used. In order to identify the process used by the images in communicating the science Kress & Van Leeuwen's (2006) visual representational structures have been used. The narrative structures categorize the selected images into either action process, reactional process, conversion process, geometrical symbolism, or circumstances. Meanwhile, the conceptual structures categorize the selected images into either classificational process, analytical process, or symbolic process.

Second, the analysis was then conducted on the verbal data. The verbal data analysis is limited only to investigate the captions accompanying the images. The captions were analyzed separately using verbal transitivity based on Halliday's (1994) systemic functional grammar.

Third, the result of the verbal data and visual data analysis is used as a base to reveal the ideational relation between the images and the captions accompanied them. Finally, the findings are interpreted based on the correlation between verbal and visual data.

3.3.3 Data Presentation

The example of the analyzed data are presented in the table such as the following. Further elaboration of the data is presented in chapter IV.

Visual Analysis:

Figure 1.8 Liquid crystals are used in this TV screen.

Type of image: Realistic. The image represents the reality based on human optical viewpoint.

Type of Process: Narrative. The man as the main represented participant is pictured to look at the TV screen in front of him. The vector emanates from the man to the TV showing a beach. The man reacts to a phenomenon in front of him. The man is a reactor and the images on the tv is the phenomenon.

Ideationally: There is an action going on the image. The man's gaze to the TV screen shows that he is looking at the TV screen. From the image, the readers can easily discern the action carried out by the man is an activity commonly found in daily life.

Verbal Analysis:

Liquid crystals are used in this TV screen.

Goal	Process: Material	Circumstance of place
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The caption of the image is the form a complete simple sentence forming a statement. The circumstance of the clause is 'in this TV screen' and the goal is 'liquid crystals'. No actor is stated in the clause.

Ideationally: The caption is giving the information to the readers about the liquid crystals. Through the caption, the liquid crystals are depicted as the materials of the TV screen. Hence, it can be inferred that the author intends to tell the readers about a chemical property by representing it through an electronic device that is very common to find in their daily life.

Intersemiotic Analysis

Ideationally, the visual mode is portraying an action carried out by the man, that is looking at the TV screen. Moreover, there is another additional information stated in the verbal mode, namely the TV screen used liquid crystals as the material. Hence, it can be said that both the verbal and the visual modes are complementing each other.

By looking at the ideational meaning of the two modes, it can be inferred that there is a sense of relation between the image and the caption accompanying it. The image and text relation can be called as intersemiotic repetition. It can be seen from the image that presented a man looking at the TV screen is followed by the information stated in the caption below the image. The caption is indirectly telling the readers the TV screen that is being watched by the man is using liquid crystals as the materials. Therefore, it can be said that the verbal mode is used to strengthen the meaning of the visual mode.