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VISUAL REPRESENTATION ANALYSIS IN THE LEARNING PROCESS

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Abstract: This study aims to analyze visual representation in the learning process. This research method uses library research. Analysts in this study review or explore relevant articles that have been published in journals or proceedings. The results of this study conclude about indicators of visual representation, visual representation ability, visual representation according to learning style, errors in visual representation, and the role of visual representation in the learning process.

Keywords: visual representation, indicators, learning

1. INTRODUCTION

Visual representation is an expression that can describe something in the form of a certain illustration. Furthermore, according to NCTM (Mafirah, et al., 2020), the form of representation can be in the form of physical objects, pictures, diagrams, graphs, and symbols and can make it easier for students to communicate their thoughts. Boonen, Van Wesel, Jolles, & Van der Schoot (Umah & Vitantri, 2019) distinguish visual representations into three types, namely pictorial representations, inaccurate visual-schematic representations, and accurate visual-schematic representations. Pictorial representation only focuses on the external appearance of objects or people without paying attention to the structure of the problem situation described in the text. While the schematic representation is a picture related to the problem solution, which can be categorized as an accurate and inaccurate picture based on its relevance to the problem solution.

Some behaviors related to "graph sense" by Friel et al. (Wahyuningrum, 2021), namely (1) the ability to recognize each component in the graph, the relationship between components, and the influence of the component on the presentation of information in the graph, (2) the ability to express information in the graph related to the context, (3) the ability to understand the relationship between tables, graphs, and the data to be analyzed, and (4) the ability to recognize the suitability of the graph for the data to be presented.

Furthermore, Triono (Silviani, et al., 2021)) states that students' mathematical representation skills in the form of pictures show that many students have not been able to convert mathematical symbols into picture forms, for symbol representation skills, some students seem to have been able to use representative symbols, student errors in general seen when converting the problem into a mathematical model and for verbal representation ability some students are already able to use verbal representation although some of them are still unable to convey their mathematical ideas in their own language.

Fotakopoulou, D and Spiliotopoulou, V (Hertati, et al., 2020) made a classification of visual representations consisting of 4 dimensions, namely: 1) Type of visual representation; 2) Relationship of visual representation with material content; 3) Relationship of visual representation with reality; 4) Visual representation function. The four dimensions each have a category, such as the visual representation type dimension consisting of pictures and diagrams. The drawing category consists of sketches, comics, clips and scraps, and photos, while the diagrammatic category consists of tables, graphs, schematic views, and concept maps. The purpose of this study

is to analyze the visual representation in the learning process from the research results that have been published by previous researchers.

2. METHOD

This research uses library research methodology. Literature-based research is a form of research that uses literature as an object of study. There are several main characteristics that need to be considered in the literature study research method, namely: First, the author is faced directly with text/numerical data. Second, library materials are interpreted as a second source, meaning that the author obtains information from a second party, not original from the first party in the field. Third, the data/information obtained is "ready to use". Fourth, the library materials obtained are not limited by space and time (Zed in Sari and Irdapure, 2020). Analysts in this study review or explore relevant articles that have been published in journals or proceedings.

3. RESULTS AND DISCUSSION

Sources of data analyzed in the study came from relevant articles from various journals and proceedings which are listed in table 1 below.

Table 1. Analyzed Article Data

Author's	Title	Issue Identity	Result Issue
Ulumul Umah dan Ciptianingsari Ayu Vitantri	Representasi Viual Matematis Mahasiswa dakam Memodelkan Kejadian Dinamis Ditinjau dari Perbedaan Gaya Kognitif dan Jenis Kelamin	Jurnal FIBONACCI: Jurnal Pendidikan Matematika dan Matematika. Volum 5 Nomor 1 2019	The results showed that male subjects with field-independent styles had a stronger tendency to use unconventional representations before expressing them in more conventional representations in the form of graphs.
Wiwin Nafidatul Mafirah, dkk	Analisis Kemampuan Representasi Visual Siswa Pada Materi Pengolahan Data Ditinjau Dari Gaya Belajar VAK	Jurnal J-PiMat Volum 2 Nomor 2 November 2020.	The results showed that the dominant visual representation was owned by students with visual learning styles. Students are able to convey their ideas using pictures such as histograms, line charts, and tables. In the process, students are careful and detailed in giving titles and image identities. Visual representation of students with auditory learning styles tends to be less thorough in drawing histograms, line charts, and tables. Students with this learning style often neglect to give titles and identities to pictures. Visual representation of students with kinesthetic learning styles tends to use words containing actions/actions in solving a problem that should use tables or diagrams. For example, students with this

Author's	Title	Issue Identity	Result Issue
			learning style often use the words make, really, and obey.
Sri Hertati, dkk	Representasi Visual Buku Biologi SMA	Prosiding Seminar Nasional Pendidikan, FKIP UNMA 2020	Visual representation has an important role in biology textbooks because it can make it easier for readers to understand the concepts being studied. In addition, it can also increase student interest and motivation so that it will provide good learning outcomes.
Ayunda Sri Wahyuningrum	*Analisis Kesalahan Mahasiswa dalam Menyajikan Representasi Visual Data Statistik pada Mata Kuliah Biostatistika*	Jurnal EduBiologia Volume 1 Number 1 Januari 2021.	The results of this study revealed that there were several types of errors made, namely errors in providing information or conveying information, errors in understanding mathematical concepts contained in the graph, errors in interpreting the numbers listed on the graph, and errors in choosing graphs that match the purpose of presenting the data.
Endah Silviani, dkk	*Analisis Kemampuan Representasi Matematis Siswa SMP pada Materi* Statstika	Jurnal Mosharafa: Jurnal Pendidikan Matematika Volume 10 Nomor 3 September 2021.	The conclusion obtained from this research is that the indicators of verbal representation ability and image or visual representation ability indicators of the three subjects studied are quite mastered. In the indicator of symbol representation ability, only two subjects have mastered it, while one other subject does not understand symbol representation.

3.1 Visual Representation Indicator

Indicators of visual representation according to research results by Silviani, et al. (2021) namely verbal representation ability, image or visual representation ability, and symbol representation ability. These indicators are reinforced by Mafirah (2020) including visual representations in the form of table diagrams or graphs with operational indicators, namely presenting data or information from a diagram, graph, or table representation, and using visual representations to solve problems. Visual representation in the form of images with operational indicators, namely making picture diagrams (pictograms), bar charts, or line charts, and making pictures to clarify problems and their solutions.

3.2 Visual Representation Ability

Visual representation ability according to the results of research by Umah and Vitantri (2019) found a difference that male subjects with a field-independent style had a stronger tendency to use non-conventional representation aids in the form of graphs, while female subjects with field-dependent cognitive style were more procedural and used the method of visual representation. routine. Furthermore, Triono (2017) states that the ability of students' mathematical representation in the form of images shows that many students have not been able to convert mathematical

symbols into image form, for the ability to represent symbols, some students seem to have been able to use representative symbols. Specifically, Faradiba, et al. (2019) describes the ability of visual representation in mathematics learning, namely: students can represent mathematical concepts in the form of pictures, students can represent the concept of multiplication in the form of pictures, and students can compare two numbers in the form of pictures.

3.3 Visual Representation According to Learning Style

Visual representation according to learning style according to Mafirah, et al. (2020) that visual representation is dominantly owned by students with visual learning styles. Students are able to convey their ideas using pictures such as histograms, line charts, and tables. Visual representation of students with auditory learning styles tends to be less thorough in drawing histograms, line charts, and tables. Visual representation of students with kinesthetic learning styles tends to use words containing actions/actions in solving a problem that should use tables or diagrams. The results of this study are also supported by Ahmadi's research (2019: 43) which concludes that students with visual learning styles tend to be able to display illustrations in the form of pictures when working on questions. Students with auditory learning styles tend to have a less dominant style of visual representation ability. Students with kinesthetic learning styles are less able to illustrate pictures in solving problems.

3.4 Error in Visual Representation

Errors in the visual representation according to research results Wahyuningrum (2021) concluded that there were several types of errors made in visual representations, namely errors in providing information or conveying information, errors in understanding mathematical concepts on the graph, errors in interpreting the numbers listed on the graph, and errors in choosing the appropriate graph to present the data. Furthermore, Triono (2017) in his research states that student errors are generally seen when converting problems into mathematical models and for verbal representation abilities, some students are already able to use verbal representations although some of them are still unable to convey their mathematical ideas in their language.

3.5 The Role of Visual Representation

Research results Hertati, et al. (2020) concluded that visual representation has an important role in understanding biology textbooks because it can make it easier for readers to understand the concepts being studied. In addition, it can also increase student interest and motivation so that it will provide good learning outcomes. Suningsih & Istiani (2021) convey some of the skills that must be possessed, namely the ability to display something in the form of symbols, tables, diagrams, or other media, all of which aim to clarify problems and are ultimately used to design models in problem-solving in mathematics. In this case, one of the mathematical abilities that include some of these aspects is the ability of mathematical representation. The ability of representation is very important because it is used as a basis for learning mathematics.

4. CONCLUSION

The results of this study are described as follows: 1) Visual representation indicators include; verbal representation ability, image or visual representation ability, and symbol representation ability. 2) Visual representation skills include; can understand data/information in the form of images, and can compare data/information in the form of images, can representing data/information in the form of images. 3) Visual representation according to learning style, namely; students with visual learning styles are able to convey their ideas by using pictures, students with auditory learning styles tend to be less thorough in drawing, and students with kinesthetic learning styles tend to use words containing actions/actions in solving a problem. 4) Errors in visual representation, among others; errors in providing information/information, errors in understanding existing concepts, errors in interpreting the numbers listed in the images, and errors in choosing images that are in accordance with the purpose of presenting the data. 5) The

role of visual representation, namely; making it easier to understand the concept being studied, can increase interest and motivation to learn, and as a basis in the learning process.

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