

Image theory and map reading through the Textbook Analysis Network

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Abstract:

Background: Image theory falls within the field of graphic semiotics and occupies a prominent place within the general structure of semiotics or what is also called "codes science".

As a structure of graphic achievements, this theory is a systematic framework that surrounds the various rules of graphic construction, and an element that facilitates the visual perception of the information expressed as a map.

Maps are one of the necessary and most practical tools in the educational process, and the teacher focuses on providing skills to students through various activities using images, atlases, diagrams and various maps, which needs prior planning, effective teaching and practical training for students.

Materials and Methods: we worked on the textbook analysis network, and took as a model "Al Manar" Geography book for the second year of High School, in literature, humanities, Islamic sciences, Arabic language with original education, agricultural sciences, economics, management sciences and agricultural sciences.

Results: The number of maps of the studied textbook sits at 101, equivalent to 22% of the total documents of the book.

Conclusion: Using, reading, and analyzing cartographic documents depends on learning cartographic expression rules. We believe that the time has come to integrate the learning of automated mapping to keep up with rapid developments in this field, where modern and digital methods and various technologies in map design and production have replaced traditional and manual method.

Key Word: Image theory, map reading, Semiology, Analysis Network.

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I. Introduction

Mapping requires adherence to a set of rules that make the map a universal document whose contents are understood by all, even if their language is different. These rules form what we call cartographic semiotics or Carto semiotics, which is followed according to the nature of the data and the elements to be represented.

Map reading is based on the mental perception of the information. This reading creates a link between the symbol and its connotation, and thus between the information and its mental image for the reader, so it is a basic skill such as the skill of reading a book or solving mathematical operations.

Like any other language, the map language must be learned before using it, as it contains vast amounts of information about the world. It is a short language that enables the transmission of a lot of information more clearly than any other educational means of the same size.

In this article, we will try to identify the various aspects of map teaching related to image theory through the secondary textbook analysis network

II. Image theory and cartographic reading

Graphic expression in general, and cartographic expression, is a theoretical framework that structures the image system. It is the framework that Jacques Bertin called "image theory", a theory on which cartographic reading is based, from which its scientific efficacy is derived, as well as its didactical frame.

1. Image Theory

This theory falls within the field of graphic semiotics, of which Bertin is considered one of its most prominent pioneers. Given its semiotic character, this theory occupies a prominent place within the general structure of semiotics or also "code science".

As a structure of graphic achievements, image theory is a systematic framework that surrounds the various rules of graphic construction and help to the visual perception of the information expressed graphically.

Image theory is illustrated by a set of concepts that we will address by explanation when we review the components of this framework.

1.1. Image definition

The information's perception is subject to a series of visual processes that may be either instantaneous or may occupy a time space requiring visual selection to extract that information from the total displayed transmissions. The sum of these processes leads to what we call the perceived image.

An image is thus defined as a semantic form that is perceived in the last moment of vision, and as well as a set of graphic relationships that the reader is familiar with at a moment of perception, which takes a visual form that is a mental unit.

Here it is necessary to distinguish between the image and the shape. The latter is a tangible physical unit linked to the paper or to a "linear or geographical framework."

1.2. Image forms

The picture takes different forms in which we distinguish:

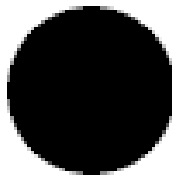
- The concrete shape: that is when the image has a high ability to suggest. The shape below it suggests a car and nothing else.

Figure 1: A model of concrete shape



- The abstract form: a form in which the image has a high generalization capacity, which weakens the power of the object itself. The figure below may suggest a group of elements (city, planet, well ...)

Figure 2 : A model of the abstract shape



- In addition, there are images that everyone can easily perceive, as the symbols on them do not need a key as the shape below (no eating).

Figure 3 : A model of the function shape



2. Cartographic Reading

Cartographic reading is based on the mental information's perception. This reading creates the link between the symbol and its significance, and therefore between the information and its intellectual image for the reader.

2.1. Definition of cartographic reading

Cartographic reading is a form of reading that enables the reader to reconstruct a graphic speech into a written one. It is also a visual transmission in which the transmissions of information expressed in mapping are identified by linking symbols, expressing information, to their true meanings by sight.

2.2. Cartographic reading stages

Reading a particular graph requires a set of processes aimed at explaining the perception and elements of the information represented. These same processes constitute the stages of cartographic reading when it comes to a map document. The stages of cartographic reading are limited to two phases: the first relates to external and internal specificity and the second relates to the understanding of the information represented.

2.2.1. External and internal selection

It is an essential stage in cartographic reading, through which the perception of the surroundings of representation is realized both from the point of view of pronunciation, phrases, and graphic creation.

2.2.1.1. External selection

It is the first step that the reader submits to a particular map document, as it must first embody in the idea of components (i.e. key elements) and then the hard (i.e. title)

Figure 4: The role of the title and key in determining the identity of the document



Otherwise, the absence of the key and the title may make it difficult to perceive the constant and the components, as the following figure shows.

Figure 5: Lack of key, title, difficulty of perceiving hard and components



2.2.1.2. Internal selection

This is a step in which the reader recognizes the visual variables by which the components of the shape or graphic structure are represented. The shape brings out energy sources as a component expressed in a variable shape. This step requires the use of the key when it comes to network variables to extract their significance.

2.2.2. Perception of original missions

These missions are aware of the information represented after the external and internal identification processes have been completed, and after you have learned the meaning of the words, or the components of the information are counted. The perception of the original missions requires the formulation of a question or a set of questions, the answer to it is the basis of perception of information or messages.

2.3. Categories and levels of questions in cartographic reading

Cartographic reading is related to the nature of the questions asked, which are determined according to their types and levels. The questions employed in reading a cartographic document are divided into two main

categories: one in which questions are directed about an element or group of component elements after defining the field, and a second category in which questions are directed towards a specific field after defining an element or group of component elements.

The levels of questions in the cartographic reading are divided into the initial level, when the questions are required by one component, which reaches a single mission, and then the middle level, when questions that require a set of elements or categories, which leads to the answer to a group of missions, then the total level, that is, the question that calls for the perception of an overall picture.

2.4. Cartographic Reading

Correct cartographic reading is based on graphic rules, it is the total of the observations that allow to embody the perceived differences in vision, and this reading touches three areas:

2.4.1. Graphic density

Which is the number of visible spots or symbols represented in one square centimeter. This density varies, depending on the cartographic representations, both in terms of the ways in which they are created, and the nature of the information embodied in it. The cartographic reading of these representations is valid only within certain limits, guaranteed by the distribution of visible spots over a reference area of square centimeters (cm²).

A combination of factors controls the determination of optimal graphic density, including:

- The number of different images determined by the length of the component.
- Used localization forms (bullet, linear, surfacic).
- The visual variables employed in the expression.
- Acquired reading habits.

The graphic reading depends on the density that considers a particular representation, as these levels are influenced by the size of the particularly high graphic density.

Figure 6: weakness of the density of symbols and unreadability



Figure 7: Perfect Intensity

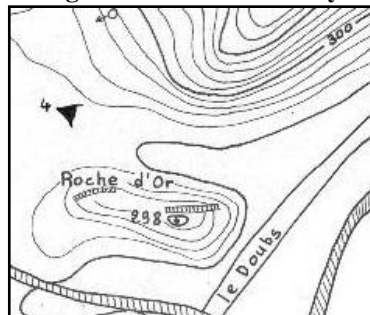
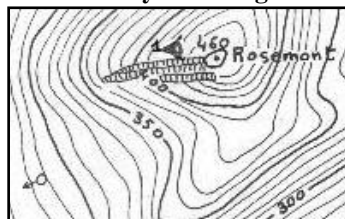


Figure 8: High density and difficulty to distinguish between the used symbols



This effect varies by levels, as it is easy to read at the overall and intermediate levels, while at the initial level it is clearly difficult to avoid changes observed in certain details.

2.4.2. perspectives Reading

The shapes or symbols that are differentiated by the shape change are perceived according to the perspective knowledge, the smaller the different shapes and their dimensions are, the more difficult it is to distinguish them. These shapes may overlap and lead directly to one form, the point or line. As a result, the shape becomes significant at the initial reading level, when it has enough volume to make it readable.

2.4.3. The network reading

Network reading applies to what we call elevation differences and is primarily concerned with improving the third-dimension variable. Thus, the representation must bring out the contrast between the basement or the background and the represented form. The information represented clearly by showing the original missions and displaying the basement or background so as not to obscure the original mission and make representation difficult to read.

The practical procedure that can distinguish the shape from the basement is limited to the following processes:

- Weaken the vision of the basement, by reducing its symbols and its vision graphically.
- To clarify the vision of the original information by highlighting its symbols.

On the other hand, the distribution of the amount of blackness within the space of the symbols used must be balanced with the representation area. Its quantity should not be so weak that it is difficult to read and thus isolate groups, or more widespread to the extent that they affect the overall form of representation. The optimal reading is embodied when the blackness occupies between 5% and 10% of the function space, that is, when there is a balance between the icon space and the representation space.

On another level, the differences must be felt in different types of cognition (quantitative, regular, and selective), where reading is sound.

In quantum perception, the volume ladder of quantum symbols must be prepared, allowing it to perceive the information, in the sense that it is a tangible peace. It takes into account the characteristics of proportionality that must remain within certain limits, as Bertin considers that the reading is incomplete below 1 to 10%.

In selective regular cognition, categories are not required to be selected or counted, as reading is available even with the large number of categories.

III. Textbook Analysis Network

Through this article, we worked on the textbook analysis network, and took as a model “Al Manar” Geography book for the second year of High School, in literature, humanities, Islamic sciences, Arabic language with original education, agricultural sciences, economics, management sciences and agricultural sciences.

1. General information

- **Book title:** Al Manar Geography
- **Authors:** Mohammed Azzedine Qadri, Ibrahim Moanas, Abdelhamid Affane, Abderrahim Kinani, Abdellah Nassi, Mohammed Amettat, Mustafa Homsy, Ahmed Momine, Chakir Akki, Abdelkarim Jinani, Abdelmoula Berkiya, Mohammed Sahoud, Miluod Bakrim.
- **Publisher:** Top Edition
- **Publishing year:** 2007
- **Price:** 49.80 dhs (5 USD)
- **Level:** Second year of High School, courses: literature, humanities, Islamic sciences, Arabic language with original education, agricultural sciences, economics, management sciences and agricultural sciences.

2. Organization/Shape

Table 1: The organization elements of the textbook in terms of form

Organization elements	strongly present 3	Mostly present 2	Partly present 1	A little present or absent 0	Total
The book contains an index and a dictionary.					3
Lessons and chapters are logically arranged.					3
The classes contain clear and understandable introductions and meet the needs of the student					2
The book contains references and sources.					3
The information is up to date.					3
The reading level matches the age and the level.					1
Size and shape of the printing are appropriate					0
The shape is interesting.					0
Other (select)					
Total					15

3. Content

Table 2: Organization elements in terms of content

Organization elements	strongly present 3	Mostly present 2	Partly present 1	A little present or absent 0	Total
The book contains applications that fit for everyday life					1
The information and guidance are clearly written and explained.					2
Activities fits to content					3
Non-text elements (maps, graphs, images) are consistent and integrated with text					1
Lessons/activities have a knowledge extension and include interdisciplinary topics					2
Activities aimed at diversifying the student's abilities and interests					1
The activities contain targeted questions that encourage the development of the intellectual abilities of the student and raise them to higher levels.					3
Other (select)					
Total					13

Through our analysis of the form and contents of this book we find that it needs to be further revised and developed to respond to the needs and requirements of the students. In terms of form must work more on the colors and forms employed to be more exciting for the students.

At the level of content, it is important to develop the axes of lessons and work on the text, which is the basic basis for a student to understand the lessons programmed within the course.

4. The place of the map in the textbook

Table 3: Part of maps inside other expression forms

Forms of expression	Number	Percentage %
Texts	65	14,25
Tables	98	21,49
Pictures	89	19,51
Maps	101	22,14
graphs	76	16,66
schemas	27	5,92
Total	456	100,00

The number of maps of the studied textbooks sits at 101, equivalent to 22% of the total documents of the book. It should be noted that, although the maps are present, they are only for appeal and not a stand-alone component.

IV. Conclusion

Using, reading, and analyzing cartographic documents depends on learning cartographic expression rules. Controlling the means and methods of cartographic expression improves student's ability to read maps, even if their abilities differ from their sociocultural and socioeconomic mentality and circles.

But it is noticed that most second-graders are not good at reading maps because they do not have lessons on the rules of cartographic expression.

Therefore, we believe that it is necessary to work on allocating independent courses to teach the rules of cartographic expression and to adapt the programs and curricula to the latest research in the field of school cartography.

We also believe that the time has come to integrate the learning of automated mapping to keep up with rapid developments in this field, where modern and digital methods and various technologies in map design and production have replaced traditional and manual methods.

Automated cartographic enables the processing of large amounts of data and information, analysis, storage, presentation and production of maps at different scales in a much shorter time than by manual production, and also facilitates mapping large quantities of symbols that require calculations, time and effort, in addition to the possibility to display geographical and map information that cannot be done by traditional methods.

GIS offers a range of possibilities to control a large amount of data and anticipate future scenarios.

But this does not necessarily mean relying entirely on it as a magic tool for all problems solving. The role of the human element remains critical in making decisions and interpreting the data provided by the automated maps and considering them as auxiliary elements and not as a substitute for the role of man in thinking, analysis, and intervention.

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