

Cognitive Problems in the Representation of the Landscape Maps of Kirkuk Governorate

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Abstract

The cognitive challenges of the map are among the most essential and visible issues confronting both the developer and the reader of the map. Overcoming these issues is dependent on the ease, clarity, and accuracy of construction. The degree of knowledge of the map-reader or user since this research was inspired by a study question that asked, "What are the most critical cognitive problems?" The researcher relied on performing field tests for a study sample with expertise in reading the map. Using a group of landscape maps as a model for the study and applying the criteria of cartographic understanding to it, it stands out in the landscape maps of the province of Kirkuk. Soil types in the research region, a map of land units in the study area, and the final model of a map of the landscape in the study area) since it belongs under the sixth category (very high cartographic insight).

1-1- The problem of the study

What are the cognitive problems that face the map designer and reader when representing the maps of the land features of the city of Kirkuk?

2-1- Study hypothesis

Most of the represented and popular maps face design and perception problems between the map designer and the reader, especially when the conditions for cartographic insight are not adhered to.

1- 3- Objective of the study:

The research aims to reach a conclusion that leads to knowing the most prominent cognitive problems of the maps of the land appearance of the city of Kirkuk, trying to conclude what are the easiest maps to understand and the least problems in production and reading.

1-4 - Study Methodology:

The study relied on the landscape approach mainly as it depends on the analytical description of the morphology of the landscape and its classification into ground units. Using remote sensing data and geographic information systems, the purpose of which is to produce objective maps with accuracy and high visual perception, and this approach is one of the closest approaches to the field of geography because it depends on the idea of the curriculum for the region

1-5- Location of the study area:

Spatial boundaries: The study area is located in the northern part of Iraq, between longitudes (25.43° and 44.44°) in the east and two latitudes (45.34°, 36.00°) in the north, bordered by

Erbil Governorate from the north and from the northwest by the Governorate Nineveh, to the east and north-east, Sulaymaniyah governorate, and from the south-west, Salah al-Din governorate. The area of the governorate is (10,205 km²). The governorate includes four districts (the center of Kirkuk district, Hawija, Daquq, and Debs), and it is administratively affiliated with fourteen Sub-district (Kirkuk District Center, Shwan, Al Rabeeh, Qara Hassan, Baiji, Debs District Center, Altun Bridge, Jerusalem, Hawija District Center, Riyadh, Abbasi, Zab, Daquq District Center, TazaKhurmatu).

1-6- Perceptual problems of landscape maps

The cognitive problems are also closely related to the design problems, for the two are similar in the subject of obstacles, but the latter relates to the reader and the first relates to the designer himself. processed.

Representation and efficient browsing are necessary to reach good cartographic insight (visual information is based on: overview, zoom in and out, filter, and then search for details based on the user's need), and what is not hidden to anyone is that the map reader plays the main role in the power of cartographic insight. It is the main link in the cartographic communication system, which consists of (the map designer, the message map, and the recipient, i.e. the map reader). The reader's level of awareness has a great role, and the level of awareness varies between those who know and those who do not know the interpretation of the map.

Good map reading allows users to explore the objective map and access information quickly. The best awareness rate is for simple map structures or for expert users. Otherwise, the confusion rate will be high for beginners in map reading. It is better to set predetermined reading paths and it is easy for users to identify any place on the map. The map and another, while comparing it with reality when traveling by car or plane, and thus helps users to build their own knowledge.

We can distinguish two types of users of thematic maps:

a. If the user has a specific question (such as a query language for a specific object in the thematic map), it is appropriate to consider the relationships between regions, allowing the user to obtain more accurate answers than if he used traditional search methods that look at events by words in the map.

B. If the user of the map does not have a specific purpose of using the map, but only wants to explore it, he must have an overview of the thematic map, in order to know where to start browsing the map.

The first type of information retrieval does not require specific visualizations, the text interfaces in the map are sufficient to reach the goal, while the second type of information retrieval is more complex. As the subject of the user's interest is not clearly defined, as in the case of tourists reviewing a map of a city they visit for the first time, and they They need to know what to see and how to get to different places quickly, they either follow a certain guide or explore different places on their own.

This is the responsibility of the cartographer, who should take into account when drawing the map and represent the different topics on different and appropriate forms of cartographic representation. In order to reach the best quality of cartographic communication between him and the map reader, and this is the content of cartographic insight, all users when reading the map In their imagination, a certain perception is formed, but the goal of reading this map

varies from one person to another. Rather, to take into account the extent of cartographic insight of the map, as well as to take into account the different perceptions and perceptions of the map readers, each according to his need and cultural level (2).

It can be concluded that there are two types of requirements: representation and browsing. Good representation helps users identify important needs, while efficient map browsing by the user is necessary to access information quickly. Among the most important cognitive problems that stand in the way of the reader and hinder his reading of the map, the most important of them are (the contention of the components of the map, the speed of his perception, the size of the paper, etc.).

1-7- Perceptual tests of the landscape map in the study area

The Model is an ideal representation of the real science built in order to display specific characteristics, it is to simulate reality by replacing similarities through the process of building models. Modern, shapes vary between simple, which explains a phenomenon and a complex, which shows the overlap of relationships and their repercussions to derive a new phenomenon, where the cartographic model depicts information about the study area, whether in a clear and understandable way or in a complex way that needs interpretation, and each map produced by the program is derived from a digital information map It is only part of a cartographic model that consists of a set of two cartographic layers. Each layer of the map has a homogeneous meaning, such as a topographic map layer that includes several layers (gradient, elevation, surface features...), where most of the data of these layers appears in a basic map that shows the features Territory (3).

The criteria adopted by the researcher for the purposes of comparison.

A- Accuracy:

The element of accuracy is one of the basic pillars upon which all standards for preparing maps are built by building a basic base upon which all rules of map design. Drawing and production are built, which constitute a clear basis for evaluating any cartographic work, represented through the relationship of drawing operations signed on the map. Its relationship to what it represents on the nature In fact, the evaluation of the accuracy in preparing the maps is expressed in each step of the preparation and the quality of the final product of the preparation, which results in the map (4).

Therefore, the stages of preparing the digital map depends on three elements: the physical entity, programs, and the use of skill in operations management. It depends on accurate and highly calculated measurements, because the preparation of the map depends on the accuracy of data, programs, and the user who requires high know-how in managing operations and finalizing the map. And with very high accuracy, and that accuracy is in the lack of errors, whether monitoring errors or recording errors, and the element of accuracy depends on the accuracy that can be achieved through the implementation of signed symbols and contrast, that is, the accuracy of measuring symbols by providing ready-made symbols with graphic programs with accurate measurements being processed. With high accuracy, and accurately predicted in the appropriate place for it, and that the high flexibility in design through the options stored on the programs is with options that reach hundreds and thousands. Whether the gradients of shades are qualitative or quantitative, as well as flexibility in the areal shading and colors that it provides, which reach tens of Mixed colors and options.

b Visual perception:

The element of perception constitutes a basic criterion upon which the maps are based, as the success of any map depends on it. Through the use of the visual language and the extent of the consistency of the visual variables that give different means of perception in which the transmission itself is an inferential system that gives the final interpretation of those visual data. The preparation of maps, in which the level of awareness depends on the variance of map users, as the responsibility for preparing, drawing and designing maps and the final output rests with the map maker. The success of any map depends on the selection and skill of the cartographer in selecting the appropriate symbol. Its design and its experience in representing phenomena on the map in a way Realized, as it became possible to offer options with flexibility in representation that may reach dozens of models. To represent them on maps through the principle of intellectual communication between the user and the program and providing it or devising any symbol or designing it with graphic programs with different capabilities (5).

1-7-1. Building cartographic models:

Geographical information systems (GIS) are used effectively to provide the best models and simulate spatial patterns, so the information systems have added effective search tools for spatial analysis, which enables to identify the factors of spatial interaction. At a detailed level, and there are those who feel more thanks to the use of maps and their layers more than the use of equations, and for building models Cartographic focus on the most important things, including (6):

- 1- What are the variables that should be included in the model?
- 2- How to determine the weights of the variables.
- 3- Linking the variables.

1- Choose the variables

It is assumed that the variables that are categorized into a phenomenon are the ones we want to model, so they must be integrated into the composite evidence. As it is possible that the error in our belief about the important variables, in addition to the high cost of data collection, for this you have to make the composite evidence through the data Available.

2- The weight of the variables:

After choosing the variable, determine the relative addition of each variable to an index in general, and this is done by specifying numerical weights for each of the variables in constructing the index. The weight of the variable is an effective tool for integrating the map variables - the different layers of data.

- 2- The link between the weighted variables: The last step that is taken is the equation that determines the degrees of the final component or the index. Once the equation for the composite index is determined, it is entered into the program in order to make the matching between the spaces and the formation of a new methodological categorical map (7).

1-8- The cognitive test of cartographic models:

At the present time, the map plays a major role by being a means of transmitting geographical information, and it also allows for a quick and clear realization of the data represented on it

(cartography), and with it, we dispense with tables. Data and complex statistical data of perception, which requires great time and effort for the purpose of absorbing it, so the map is prepared. Objectivity is one of the maps that studies have focused on, especially the issue of visual perception, as it embodies geographical facts as it conveys the message to the reader.

Therefore, there is an urgent need to study the landscape map designed by the researcher, which is one model, and there are no ways of representation to be compared.

Therefore, this cartographic model is chosen to identify the validity of this designed model and then know the speed of its perception by the reader.

1-8-1- Samples and methods of selecting them:

In her research, the researcher depends on choosing a specific sample from the society to which her research is subject, and she chooses this sample according to certain methods. The designer through his test to obtain the cartographic insight and perception of the reader, in order for this to be possible in giving the extent of awareness of the designed model, and attention must be paid to the design of the sample. Through which we aim to know the speed of his perception of the model, so (151) samples were selected from the geographical center as a model for testing. The model designed in the study area for some professors, postgraduate students and preliminary studies. Because this model is the only representation that expresses the representation of the land appearance and needs a cognitive test, where the test using the questionnaire form through a direct personal interview, and also clarifying the objectives and content of the study and the purpose of the test and the method of answering on the form,

1-2-1- Cognitive criteria used in testing the designed model:

The map represents the essence of the communicative process in cognition, as the map is a source of information, a means of composition, and a significant tool in educational activities in general and geographical studies in particular. Syntactically on the various elements of the geographical field, which allows for the scrutiny of its study and knowledge, or for expressing the results of research related to the field. Therefore, through the map it is possible to highlight the spatial relations of the various natural and human phenomena, as a person can contemplate or study the surface of the earth or part of it, bypassing the administrative borders. 8).

Among the criteria used to measure the power of perception are:

- 1- The speed of communication between the originator and the reader.
- 2- Matching the color to the phenomenon.
- 3- Completing the elements of the map.
- 4- Psychological acceptance and clarity.
- 5- The content and integration of the map.
- 6- Effective map.
- 7- The aesthetic and attractiveness of the map.
- 8- Visual variables.
- 9- Type of symbols and their meanings.

1- Speed of communication between the originator and the reader:**Table (1) Testing the speed of communication between the creator and the map-reader in the study maps**

Number of Map	Name of Map	perception time per second	perception time speed ratio of 10%	speed of perception perception speed ratio - 20)
1	Map of soil types in the study area	5	2	19
2	Regression map of the study area	6	3	18
3	Elevation map of the study area	4	3	19
4	Map of the land units in the study area	5	4	19
5	Map of the water network in the study area	7	4	17.5
6	The final model of the landscape map in the study area	4	3	18.5
7	Map of the Earth's features at a scale of 1:17 km for the study area	4	2	19
8	Map of the Earth's features at a scale of 1:9 km for the study area	10	6	14.5
9	The color map is random, not well perceptible	5	2	18
10	The color map is world-class and well-perceived	8	5.5	13
11	Poorly designed map without basic map elements of the map for the study area	5	3.5	18
12	Wrong map in choosing symbols for the landscape in the study area	8	4.5	14.5
13	Map with all kinds of symbols to add health to the design	9	6.5	15
14	Wrong map in the type, size, color and direction of the font used in designing the map	5	3.5	13
15	Correct map in choosing the type, size and color of the font for the study area	9	5.2	17
16	A map with the balance of the components of the map to get rid of the design problems of the study area	5	3.6	17

Source: From the researcher's work based on the results of the cognitive speed test in the study maps.

2- The criterion of color matching to the phenomenon:

It depends on the design of the map of all kinds, provided that the color matches the phenomenon to be represented. It helps the eye to distinguish easily between symbols, as it gives a selective tint to the represented phenomena, as it helps to distinguish between phenomena. Convergent colors, the colors were used to match the phenomenon of the study according to international systems.

When applying the criterion of color matching to the phenomenon and the psychological and aesthetic acceptance of the effective map on the studied samples. Its results were shown in Table (1), as it showed that the color matching of the phenomenon studied in the matter of choosing the color of the units of the landscape varies according to the type of the ground unit.

3- Psychological acceptance and clarity:

One of the important criteria is the psychological acceptance of the map reader and the speed of realization and understanding of the elements of the map and the phenomena represented on it, as this criterion is adopted in the map community. Which depends on clarity and satisfaction on a large scale from referring to the emerging maps of the model and aesthetic possible shift of the cartographic representation, so one of the tasks of the designer. The map made it acceptable and familiar through many factors that contribute to the psychological acceptance and clarity of the map, and facilitate its understanding by the reader, which is one of the first reasons that contribute to raising the level of cartographic insight.

4- The criteria for fulfilling the elements of the map:

Through the study, we find that all the model has achieved a full rate of (10)% for the criterion for fulfilling the elements of the map, with regard to the map title, map frame, map coordinates, drawing scale, direction symbol, map key, and the general shape of the map.

5- Map content:

This criterion is one of the important criteria in measuring the map reader's cartographic insight, by stimulating his visual senses in reading the map, where the successful map is the one that shows the relationship between geographical phenomena. Which is more comprehensive to geographical phenomena, the importance of the content of the map is the manifestations of the earth's surface Which allows the reader to analyze and compare the features of the Earth's surface through the contrast in this map (9).

The map of contemporary surface features of the earth can be dealt with in geographic information systems, and that this method has problems that could be addressed in the previous model. These problems prevent the understanding of the content of the phenomenon represented on the map, so these problems reflect an impression on the map reader in the difficulty of perceiving and understanding the map.

6- Effective Map Test Standard:

This criterion is considered one of the important criteria in testing effective maps of spatial information in representing the geographical data of a phenomenon using geographic information systems to draw the phenomenon appropriately. The design reflects the representation of the geographical phenomenon in an appropriate manner that facilitates the perception of the map. These colors and representation methods are subject to change and deletion by the program, so this map is effective. The use of space data has a great potential in designing a map of the landscape that is effective in all its elements.

7- The criterion of the aesthetic and attractiveness of the map:

This criterion is one of the important criteria in perceiving the map, so the map designer pays attention to this criterion for his contribution to the identification, adaptation and communication with the environment. With quantities of data that must be dealt with to produce maps with an artistic sense that are perceived by the reader, and to contribute significantly to the psychological factor and the reader's satisfaction in drawing his attention and raising the level of cartographic perception (10).

The aesthetic of the map represents an essential aspect in the process of attracting the reader, as it represents the image or model through which the reader takes it through consideration and explanation, and it is the result of personal emotions that have the greatest role in the mapping perception of the reader.

8- Standard for testing the visual variables of the map

Visual variables are considered important criteria in preparing and designing maps, because using these variables correctly increases the aesthetics of the map, and using colors that give the map more aesthetic than using white and black, and this thus reflects on the psychological factor of the reader, where the map is more and faster perceptive. The cartography is characterized by the availability of several visual variables to represent and simplify the information to be drawn. Shape, direction variable, color variable, value variable, structural variable, size variable (11), where several patterns are used (linear, area and point signature pattern), the study relied on the linear signature pattern to represent the studied phenomenon (ground appearance). The use of geographic information systems in data representation, allowing easy representation of visual variables, which contribute to raising the level of cartographic insight for the reader, which is more aware. First, use the shape variable, the color variable, and the size variable to represent the geographical phenomenon on the map.

9- Testing the criteria for the type of symbols and their significance in the study maps:

The map is only a symbolic representation, and the map contains symbols that represent different phenomena on the surface of the earth that differ in their shape and area from the original that they represent, according to the scale of the drawing used. Therefore, this required abbreviating many geographical features, whether natural or human, so as not to The map is crowded with information, and it can be read and interpreted easily and easily, hence the need to use specific methods to clarify these features (12).

Map symbols are defined as a set of visual signals or variables that aim to communicate an idea or information to the reader and user of the map (13).

9-1- Conducting the final exam:

After the criteria were tested for the land appearance model in the study area to find out the final test rate as being more acceptable and aware of the components of the map and showing its elements clearly and the consistency of the contents of the map. The speed of communication between the origin, the reader, the extent of the aesthetic and attractiveness of the map to the reader, and the extent of psychological acceptance of the reader and the use of visual variables.

In this method, the previous criteria are collected according to their ratios and then combined to produce a final result out of 100 that shows the degree of the final estimate of cartographic insight. The higher the ratio, the higher the insight. It became clear from the application that there are nine criteria and a result out of a hundred was obtained, which is that the study collected the proportions of the six criteria and then multiplied them by ten and then divided them by six to get a final result out of 100. As in Table (2).

Table (2) Final estimate of cartographic insight

Map number	Name of map	The speed of communication between the originator	Completing the elements of the map	color matching phenomenon	Psychological acceptance and clarity	Effective Map	The aesthetic and attractiveness of the map	Symbols type and meaning	visual variables	final rate 100% Cartographic Level	Insight Level
1	Map of soil types in the study area	19	9.6	9.3	9.4	9	8.4	9.5	4.1	78.3	
2	Regression map of the study area	18	9.1	9	9.2	8.3	7.7	8.45	4	73.75	
3	Elevation map of the study area	19	9.3	8.2	8	7.9	8.8	7.75	3.8	72.75	
4	Map of the land units in the study area	19	9.4	8.8	9	8.8	9	8.8	2.8	75.6	
5	Map of the water network in the study area	17.5	8.9	8.7	9.2	9	8.8	8.45	4.2	74.75	
6	The final model of the landscape map in the study area	18.5	9.5	9.1	9	9	9.2	9.25	7.8	81.35	
7	Map of the Earth's features at a scale of 1:17 km for the study area	19	8.6	6.3	6.5	6.4	4.4	7.2	4	62.4	
8	Map of the Earth's features at a scale of 1:9 km for the study area	14.5	7.7	9.1	9	8.8	9.5	8.75	4.1	71.45	
9	The color map is random, not well perceptible	18	5.2	6	6.5	4	3	5.6	3.1	51.4	
10	The color map is world-class and well-perceived	13	8	8.6	9	8.5	9	8.8	6.5	71.4	
11	Poorly designed map without basic map elements of the map for the study area	18	8.3	7	7.6	8.6	4.8	7.55	4.6	66.45	
12	Wrong map in choosing symbols for the landscape in the study area	14.5	8.6	5.5	6	5	5.6	4.5	4.3	54	
13	A map with all kinds of symbols to add health to the design	15	8	9	9.3	7.9	8	8.9	5.1	71.2	
14	Wrong map in the type, size, color and direction of the font used in designing the map	13	5.1	5.5	6	4.5	4	6.55	2.8	47.45	
15	Correct map in choosing the type, size and color of the font for the study area	17	8.8	8.1	8.8	9	9	7.85	4.6	73.15	
16	A map with the balance of the components of the map to get rid of the design problems of the study area	17	8	8.5	9	8.9	8.2	8.95	6.3	74.85	

Source: From the researcher's work based on the results of the final cartographic insight criteria test for the maps of the study area.

1-10- Final evaluation and selection of the optimal model:

It is evident from Table (2) and through the application of cartographic insight criteria that led to new results that lead to a new understanding of the cartographic design method. Reconsideration of choosing the appropriate type of cartographic models for representation, according to the data of the data to be represented, and after applying this test on models study area maps,

It appears that the best study maps are the model (the map of soil types in the study area, the map of the land units in the study area, the final model of the map of the land appearance in the study area). AS it falls within the sixth category (very high cartographic insight), followed by the following models (the map of land features At a scale of 1:9 for the study area. A color map with international standards and well-aware, a map with the use of all kinds of symbols to add health to the design, an elevation map in the study area, a map of the water network. In the study area, the correct map in choosing the type, size and color of the font for the study area, Regression map in the study area, a map with a balance of map components. To get rid

of design problems for the study area) within the fifth category (high cartographic insight), while a model (a poorly designed map without the basics of the map elements of the map for the study area) comes within the fourth category (medium cartographic insight) High). While the model method (map of land features at a scale of 1:17 km for the study area) fell within the limits of the third category, which is (medium cartographic insight), and the model (wrong map in choosing symbols for the The land plot in the study area) within the boundaries of the second category with weak cartographic insight. The following models (the wrong map in the type, size, color and direction of the line used in designing the map, the color map is random, not well perceptive) came within the boundaries of the first category, which is (very weak cartographic insight).).

References

- 1- Benedicte Le Grand Topic Maps Visualization Laboratoire "Informatique de - Paris 2009. pp.2-4.
- 2- Benedicte Le Grand Topic Maps Visualization Laboratoire. Op. cit .pp 3-4
- 3- Fayez Muhammad Al-Isawy, previous source, pp. 345-346
- 4- Makki Ghazi Abdul-Latif Al-Muhammadi, The Cartographic Representation of the Population Distribution of Anbar Governorate, MA thesis (unpublished), University of Baghdad, College of Education, Ibn Rushd, 2002, pp. 126-127.
- 5- Makki Ghazi Abdul Latif, a previous source, pp. 137-138.
- 6- Sameh Ibrahim Abdel-Wahhab, Economic activity and the workforce in Greater Cairo, a cartographic study, doctoral thesis, unpublished, Faculty of Arts, Cairo University, 2000, p. 20.
- 7- Sameh Ibrahim Abdel-Wahhab, previous source, p. 21.
- 8- Muhammad Al-Halyush, Principles of Maps, The Course of Geographical Studies, Journal of the Geography of Morocco, Issue 20, Electronic Scientific, 2001, p. 5.
- 9- Safaa Abdel-Wahhab Aref Al-Ani, Cartographic Modeling of Climate Elements in Erbil Governorate, unpublished PhD thesis, Tikritan University, College of Education for Human Sciences, 2019, p. 234.
- 10- Safaa Abdel-Wahhab Aref Al-Ani, previous source, p. 234
- 11- Mohamed Al-Ziyadi, The Simography of Visual Variables, Ibn Zohr University, Agadir, University Season, 2012-2013, p. 3.