Evaluation of Educational Atlas Maps in Terms of Cartographic Design

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Abstract. Nowadays, many specialists in geography recommend the usage of digital maps and atlases. But in educational system, especially in Turkey, a traditional cartography based on paper maps is used more than the digital ones. This report considers the deficiencies of current atlas maps that are used in the education of geography and social studies in terms of cartographic design. About 22 atlases has been investigated for the study. Several examples are given from these school atlases and some proposals are introduced about designing children maps.

1. Introduction

Atlases are one of the most significant auxiliary materials used in the teaching of social sciences, history and geography. For this reason, it is clear that the intensive use of atlases in the primary and secondary school education will affect the use of maps in a positive or negative way.

A good number of studies in Turkey express many advantages of using maps while understanding the environment and universe. The studies in question have established the positive behavioural changes that were expected to be observed in the students and the overall training period as a result of the extensive use of maps as an integral part of the geography classes in the primary and secondary schools, [1-4]. Therefore, in order to ensure the efficient use of maps by students and the better design of cartographic concepts, experts in social studies and geography need to work with cartographers or experts in cartographic design.

2. The Atlases Used for Educational Purposes in Turkey

Atlases may be divided into several categories such as primary atlases, intended for primary schools, middle atlases for secondary schools, essential atlases for high schools. In terms of their contents, however, the primary atlases usually contain information regarding the solar system, the nature and movements of the earth, physical, political and geographical maps of Turkey, geographical regions of Turkey and its neighbours, and the physical and political maps of the world. Some of the issues identified with the use of maps in schools suggest that the primary school atlases are not suitable for curriculum-wise for the related (4th and 5th grade) students; they contain very difficult and complex maps for the children of that age group; the maps have so many detailed information shown on them; some maps do not contain a legend and those with legends have missing information or it is difficult to understand what they signify. According to the 4th and 5th grade curriculums, having a general recognition of the continents, knowing their surface areas, locations and the countries located in such continents and their

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general physical characteristics (such as altitude) as well as having such important geographical information shown on the map as the highest mountain and the longest river in the world may be regarded as sufficient. For the political and physical maps of Turkey, however, it is believed that classifying geographical information and showing the interrelated ones on the same map, rather than demonstrating so many details all on the same map, or only showing the information relevant to the students' curriculum will be more suitable. The complex appearance of a map may give rise to a prejudice on the part of the student against learning geographical maps. It is imperative that the primary school atlases are designed in a more interesting, plain and easy to understand, attractive and diligent manner for children.

The middle atlases or geography atlases generally include the visual and textual information regarding the solar system, the nature and movements of the earth, projection details in some atlases, scale, physical and political maps of Turkey, various thematic maps, physical and political maps of the world, continents and various different countries and other illustrations and texts with respect to the subject matter. Again, the contents of the middle atlases appear to be in parallel to that of the primary atlases. When examined in terms of cartographic design and children's maps design, it is observed that the atlases used for educational purposes contain incorrect information in legends, some of the colours and symbols are not legible. In line with the curriculum, the analysis and interpretation of the geographical details on the maps are expected to be different content-wise in the related (6th and 7th) grades than that of the maps designed for 4th and 5th grades. However, one recognizes no such difference in the primary and secondary or even in essential atlases in terms of their content.

It is observed that the essential atlases include the map details in the first pages (such as projections, scales, plan chart samples, astronomical information, satellite visuals in the most current ones), precipitation and climate maps of the world, geological maps, international commerce maps, population maps, physical maps of the geographical regions in Turkey, the economic, climate and vegetation maps of Turkey, the physical, political, economic, precipitation and temperature maps of all continents, the physical maps of the important countries and additionally the written information regarding their respective surface area, population and capital.

Some of the problems encountered with the atlases in terms of their cartographic design will be discussed under the headings of generalization, symbolization and production.

3. Evaluation of Atlases in Terms of Their Cartographical Design

Cartographical design should be evaluated under three main headings, namely generalization, symbolization and production [3, 5]. The purpose of generalization in the cartographic design is to ensure that the user has an easy access to the information provided in the map by eliminating the redundancies on the map. In addition to this generalization, design and legibility of the map contribute to the map in general. With a view to reducing learning disabilities, the task of choosing the objects to be included or excluded on the map – depending on the purpose, scale and presentation form (such as digital or paper) of the map – and symbolizing them accordingly is a significant phase in designing a map for children. For this reason, in designing educational maps that contain small scale thematic maps, efforts should be made to avoid unnecessary details that will create perception difficulties in children and make the map difficult to read.

One of the most important concepts that may affect the cartographic communication is symbolization. [3]. In symbolization in cartographic design, three main graphic elements are used: point, line and area to display data. Graphic symbols are created by adding graphic or visual variables called form, size, direction, value, colour and filling to the graphic elements [5, 6]. It is possible to mention two characteristics of the geographical data displaying on the map, namely the qualitative and quantitative characteristics. While the qualitative data involves such details as the location, nature and shapes of the objects, the quantitative data involve such numerical details as the amount, value and the size of the objects. In displaying the qualitative data, the following criteria should be carefully evaluated: data classification, selection of class number, determination classification method, purpose of the map,

intended user, scale of the map, etc. Data classification in children's map is very important in terms of reading and perception.

3.1. Generalization

The degree of generalization is higher in small scale maps. Atlas maps consist completely of small scale maps. For this reason, these maps require much more generalization than other maps. The ability to read and percept the map depends on generalization process.

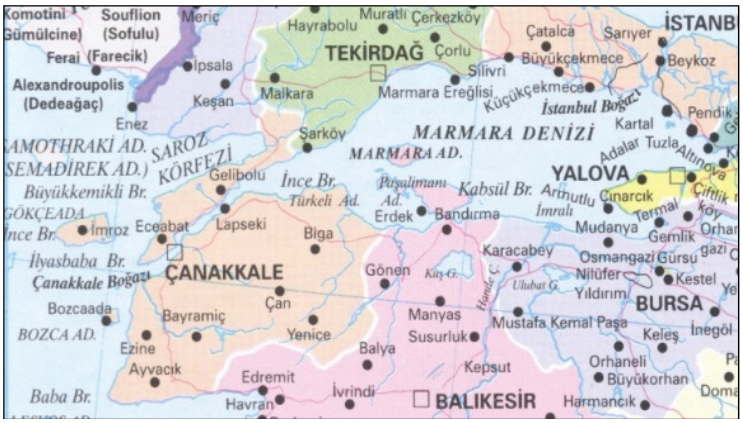


Figure 1. "İlköğretim İlk Atlas", Altın Kitaplar Publishing, İstanbul, 2006 – A part of Turkey Political Map

Due to the fact that the rivers and urban areas are failed to be generalized accordingly with the scale and purpose of the map, the readability of the map shown in Figure 2 left is reduced. Similar problems with generalization are also seen in some of the other atlases as well. Moreover, considering the fact that the primary atlases are intended for children that are just starting the primary school, it may be preferred to exclude counties in accordance with the curriculum. If more information is required for provinces, a larger scale map that displays the geographical regions individually may be more suitable. In small scale maps, however, a generalized display of the names of provinces and only the most important geographical objects (such as big rivers, important lakes, significant roads connecting cities, etc.) will make it easier for primary school children to use the maps.

3.2. Symbolization

The problems identified with symbolization generally involve the design related issues (such as form, size, colour etc.) of the symbols representing the objects, inconsistencies with map legends and mapped area etc. Most atlases include single legend, called a mobile legend, which is applicable for all the maps included in the atlas. This kind of design, intended for adult users, should not be preferred for children. Moreover, when the maps included in the atlas are examined, it is observed that the symbols used therein represent different information for each map. For instance, in the maps shown in Figure 2 middle, it is observed that the center of Ankara is designed with four different symbols, each representing different information. Moreover, it is seen that the legend includes two extra different symbols for the places with a population of more than 1.000.000 inhabitants. The data with the same characteristic and quality cannot be represented on a map with two different symbols.



Figure 2. "İlköğretim İlk Atlas", Parıltı Publishing, İstanbul – Different symbols used for city center of Ankara

Economic maps are one of the thematic maps that are mostly included in the atlases and textbooks. There are problems with the economy maps due to the too many number of data classes, resulting from their attempt to cover all the agricultural and animal husbandry, industrial and mining activities.

3.2.1. Lettering

The design problems with lettering in atlases are mostly identified in the political and physical maps. The fact that there are a lot of provinces and counties in Turkey makes it difficult to design political maps. Keeping the mapped area as extensive as possible - in other words, choosing the map scale as large as possible - ensures that the lettering for various objects is easily identified through the use of different graphic variables and maintaining a harmonious coordination of the letters and graphic symbols will improve the readability of the map.

The first physical map provided in Figure 3 shows a good number of letterings pertaining to various different objects. All the letterings, including the water objects, are rendered in black. This reduces the readability of the map. The letterings for water objects should be rendered in blue and in antique letters that are inclined either to the right or left [3, 5]. The names of the provinces appear to be lost among the mountain names, while the names of the mountains in lower altitudes cannot be distinguished from that of the rivers and plateaus as they are written in the same font type and size. The symbols pertaining to the city centres are unnecessarily large in size and not in concordance with the other letterings.



Figure 3. "İlköğretim Orta Atlas", Parıltı Publishing, İstanbul

It is observed in Figure 3.2.1.2 that some of the letterings on the map are written over the seas and some over the lands, and thus some of them overlap with each other as a result. Moreover, it is difficult to understand which lettering belongs to which point symbol.



Figure 4. "İlköğretim İlk Atlas", Saygı Publishing, İstanbul, 2008

3.2.2. Colour

The most important issue that may affect the perception of the colours in the atlas maps is the use of too many colours, necessitated by the number of classes, and failure of the colours used to represent the qualitative data accurately.

In a similar way, the colours used in the map shown in Figure 5 fail to represent the qualitative characteristics of the data. The use of the red or orange colour in representing the hottest areas and the blue in representing the coldest areas will help facilitate perception. The name of the Van lake (the biggest lake of Turkey) has been forgotten, as seen in the red circle. Moreover, choosing the blue colour for the amount of rainfall is very similar to that of the water objects and the omission of the name of Lake Van may result in the misperception of the amount of rainfall in that particular area.

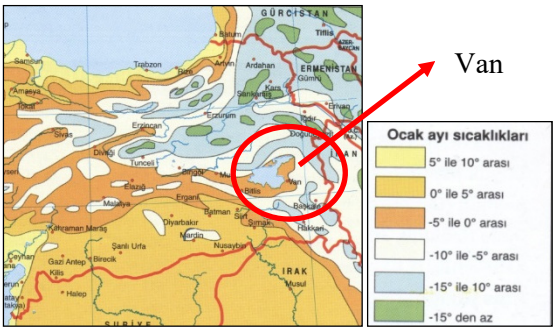


Figure 5. "İlköğretim Orta Atlas", İskele Eğitim, İstanbul, 2010

3.3. Production - Common Map Elements

It is observed that some maps fail to show the geographical location (by using longitude and latitude) and neighbouring countries and do not contain a legend and title. Such omissions may lead children to misperceive the geographical locations of the countries in the world. Moreover, the legend is one of the most important map elements that guides the map user.

The map scale must be included among the map surround elements as ratio scale or graphic scale with north arrow. The use of graphic scale in educational maps is more suitable for children ([3, 7]. It is worth noting that, in the atlases examined thus far, some of the maps therein did not include a graphic scale, some did not include a ratio scale and some did not include a scale. The scale is one of the most difficult section elements to make sense of for children. For this reason, it is observed that different designs have been used in some atlases for the children of different age groups [3].

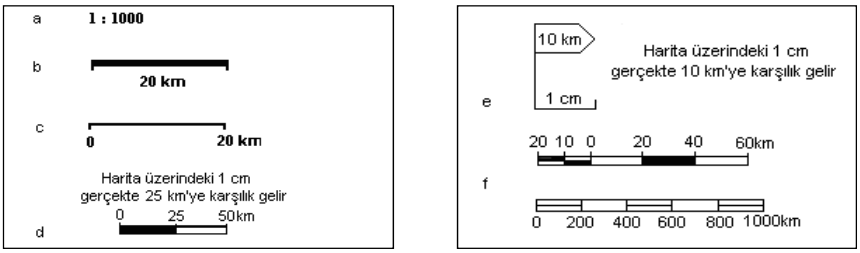


Figure 6. "İlköğretim Orta Atlas", Tutku Yayıncılık, Konya, 2010

4. Conclusions and Suggestions

An important aim of the social studies and geography courses is to gain the ability of reading, analysing and understanding maps and map concepts. In addition to this, paper documents (including maps) still have a lot of advantages in comparison to digital products: ease of use, transportation, archiving, tangibility, etc. They function as visual cues because they are easier to read, give an overview of the complete document, etc. [8-10]. In this extent, effective cartographic design and the responsibilities of cartographers and geographers, should not be ignored. Atlas maps are an important part of geography and cartography especially for younger users.

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