

Testing Maps for Visually Impaired People in Kurdistan

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Abstract: Maps are the best solution to provide geographical information for partially impaired people. Present research uses Geographical Information System (GIS) to create paper maps which can be transferred onto a touch display where the user can choose different keys and settings (such as colour, measurement, etc.) to represent different forms of data. The test was developed in the Iraqi Kurdistan and Erbil, the capital, is taken as a sample city for this purpose. The main purpose was to investigate the extent which low vision people find digital and paper mappings useful. Also, the study explores the existing reasons that non-professionals use or avoid using this technology and compares it with the traditional maps that have been used before. The analysis of the questions given to the participants showed that there is an encouraging result in low vision people using maps in the near future and they are interested in introducing these maps into school curriculum.

Keywords: Maps, GIS, Sightless

1. Introduction

Cartography is very important nowadays because it is both an art and a science, under the inevitable influence of modern technologies. The nature of cartography and map making has changed over the past few decades and will never be the same again. A map is a dream, an idea, an action and a sign of human endeavour as it can also start adventures (Virga, Vincent, et al., 2007). The modern cartographer must be familiar with both healthy people and people with various disabilities including partially impaired people, blind people and people with brain injuries who might have reduced motor control. The result of ensuring accessibility to maps is allowing all people, no matter their ability, to independently explore their capabilities and have fun.

Times ago, people with low vision were not regarded as a valuable asset to the societies they were a part of. Most of them were simply kept by families as they were often abandoned by society. By the Middle Ages, developed countries such as Europe started to operate in certainty that it is a duty of society itself to care for blind people. For that reason, France became the first country to establish a school for a person who cannot see or has low vision in 1784. Moreover, at the beginning of 19th century, Louis Braille was the leader for developing a tactile reading and writing system for blind people. His “dot writing” is still used everywhere even now (American Action Fund for Blind Children and Adults, 2017). 1835 was a unique year because the first atlas was produced for the blind called “Atlas of the United States Printed for the Use of the Blind”. This book was published at the New England Institute for the Education of the Blind in Boston. However, this atlas was not generally used because it could not symbolise geometric shapes and cartographic features although the letters were a good representation for blind people (David Rumsey Map Collection, 2012). It is difficult to know how successful the atlas was.

Both in the twentieth century and today, maps are a part of the school curriculum for both sight and low vision people. In some developed countries, they have a specific atlas for

the blind that help children learn geography. These countries are leading the way in creating accessible maps for visually impaired people. For example, AmauroMap is a type of map that was supported by the Internet Foundation Austria (IFA) within the Netidee programme from November 2009 until October 2010 (Wasserburger, Neuschmid, et al., 2010). It aims to assist blind and visually impaired people to access interactive digital city maps. Another example is that recently, Hungary produced an atlas which collected all geographical locations for healthy, partially sighted and blind people. Blind people and visually impaired people can get benefits and be familiar with all geographical information. Today, the atlas is being using by Hungarian visually impaired students (Rohonczi.A, (n.d)).

The research data was implemented using a Geographical Information System (GIS), specifically ArcGIS Desktop (ArcMap), one of the standard tools used in this research. The data is calculated from factual, estimation, and practical based research. In this specific case, it was considered appropriate to use this type of research based on GIS methods because of the necessity to obtain a representative sample. The aim of this research is to investigate the problems that partially impaired people face regarding using maps at school or outside schools. Also, the research used some sample maps through GIS to collect and analyse data to find the best solutions for them.

The Iraq-Kurdistan region can be taken as a good example as they are suffering from this kind of development (especially studying maps in school) due to the lack of geographical information for low vision peoples. After wars occurred in this area, many people lost their vision and became blind especially after the chemical attack by the Saddam regime in 1988. This attack added to the number of those who were blind from birth. Also, there is a lack of using maps in Kurdistan Governorate Region (KRG), especially for blind and partially impaired people who live in the region as they do not study maps at school

and the government dismisses them due to not having appropriate specialists who have knowledge and experience on this issue. In these circumstances, helping these kinds of people become part of humanity and it will be increasingly useful to use maps in their daily life.

For that reason, the research was performed in The Runaki Center (Kurdish for Light), which was established in 1990 to serve the blind and visually impaired people in Erbil city and many other centres have been opened recently in the Kurdistan region. The Runaki Center is linked with the Ministry of Education for providing school curriculum in both primary and secondary Schools.

In addition, it's important to mention that the curriculum and rules in primary school is the same in the whole country. Low vision students who have been accepted to study in the schools should have a visual acuity of 65 degrees. Those with less visual acuity will are not allowed to enter public education. After this step, the role of Iraqi governorate is to do another exam from the medical centre with qualified certificate and the condition for joining the secondary school is that the visual acuity should be 85 degrees Otherwise, they will not have the chance to study from normal and blind centre schools.

In the school built in 1990, two teachers, who taught Geography, confirmed that for low vision and blind students, maps were previously created from rice and beans. They were suggesting to include this same sample to compare the differences between the old technology, and new digital technology. The result from comparing both versions were that students preferred the new modern maps and rejected the old one made by hand as it shows in both Figures 1 and 2. Most of the students were satisfied with the new available technology in their schools for learning and using maps.



Figure 1: Old method of maps that used by schools in Kurdistan



Figure 2: Students excited with the samples

2. Findings and discussion:

The research was achieved by carrying out questionnaires. All students with partially low vision participated and it was for both, primary and secondary schools.

Ages of participants for such purposes were varied, from 6 to 18 years old. Students of primary schools were between 6 to 9 years. In secondary schools, students ranged from age 9 to 18 years old. Participants from each grade took part in this research. It was for both genders, although there was no difference between gender groups about using digital and paper mapping. Meanwhile, it was preferred by males more than females.

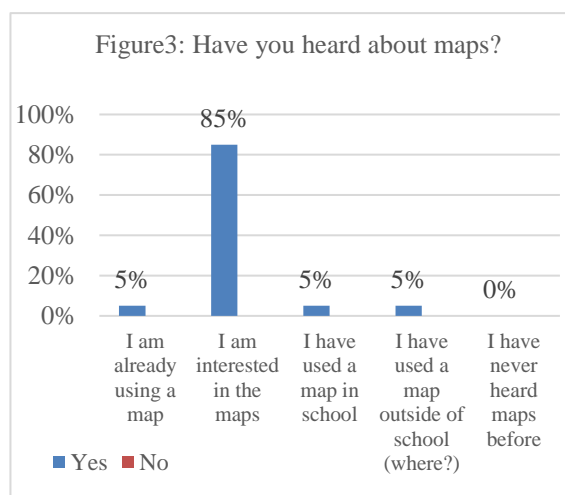
The level and range of sight-seeing differed from having visual acuity problems, having blind spots with clear vision, in between, or completely blind. That's why the answers were different for all the students.

Also, the questionnaire was divided into two parts. The first part shows questions related to general information for both digital and paper mapping. The second part tests the best solutions to create maps for partially impaired people.

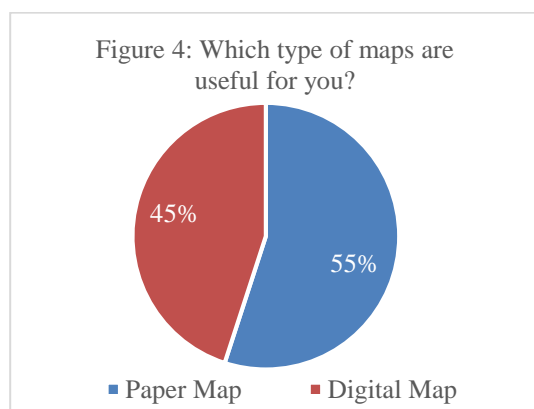
2.1 General information about using maps

The questionnaire had 12 questions in total. The text below is a brief explanation of it.

In general, the questionnaires show that 85% of low vision students were interested in learning maps and believed that maps are the best tools for communication, summarizing and recognizing places. Although the others were finding difficulties to use it in their daily life or school due to lack of available sources and information about maps (Figure 3).

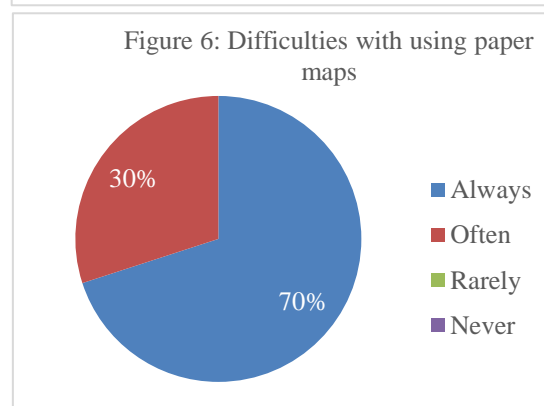
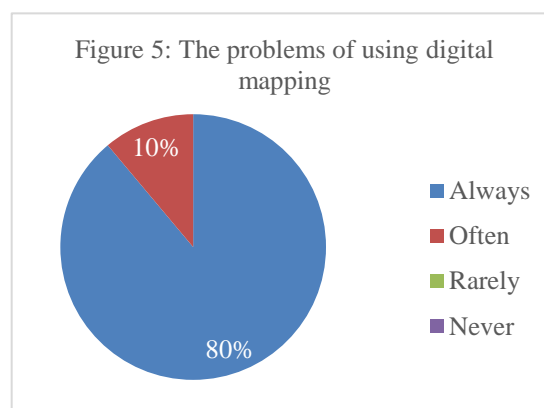


Additionally, many individuals don't know about digital mapping and paper maps. However, the researcher explained briefly a comparison between both. Digital mapping can be regarded as an alternative technique for the traditional paper-based maps. Moreover, digital mapping can be updated easily can be changed easily to alter any data if required, whereas, paper-based maps do not allow users to change or update information, graphics and images. So, the respondents think that both digital and paper mapping can serve the low vision peoples in some ways and have advantages. Digital mapping is more useful than paper due to better techniques (including sounds) for low vision people to easily find their places and directions. Nonetheless, paper is also serving visually impaired people as they can use their senses and it can also be touchable (Figure 4).



Moreover, the answers for the questionnaires show that low vision people were facing problems when they tried to use both kinds of maps. The result is totally different when they used both digital and paper mapping. In both figures, the data shows almost all participants faced problems while using maps. As it is shown in Figure 5 more than half of low vision participants presented problems: 80% always and 10% often used digital maps. The issues of using digital maps are due to the lack of having computers, mobiles and other accessories, such as: extra batteries and cameras. Also, visually impaired people cannot rely on digital mapping due to either losing battery or problems

that occur during using these techniques. Other problems for using that platform and computer maps are completely different from using paper maps. For example, using this kind of technology is based on listening and touching because it is too hard to see it on a computer or mobile phone. Furthermore, there are no specific apps that can serve low vision people in Kurdistan. In other sides, Figure 6 noted that 70% of participants always and 30% of participants often face problems when they are trying to use paper maps because these maps are not made in Iraq-Kurdistan so they cannot get the chance to be familiar with such development. In both figures, it can be seen that two options (like rarely and never) were not selected by any participants which means that they always faced problems when using both maps.



Other questions were about reliability for using both digital and paper maps. Many low vision people believe that digital and paper mapping is "totally reliable", some said, "reasonably reliable" and few said "particularly reliable". Low vision students prefer to use both techniques of mapping if they are suitable for them as it takes less time to be familiar with both techniques. However, most students show that both paper and digital maps are "unreliable" due to the difficulty of technique of using maps. Digital maps are unreliable because entering data and images into the computer might take longer and may not be updated regularly. Low vision people will receive direction slower or may even get wrong information as well. On the other hand, paper maps are unreliable due the fact that they are not regularly updated and often miss information. (Figure 7).

Figure 7: How digital and paper mapping are reliable

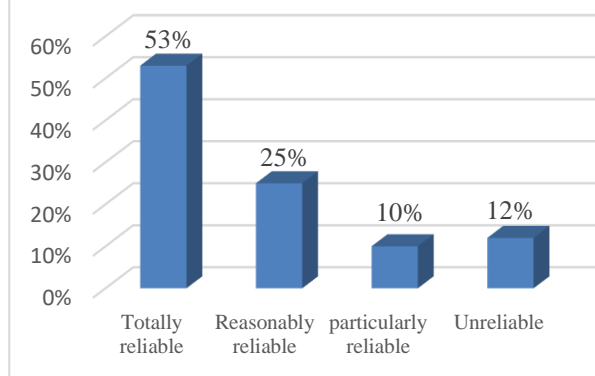
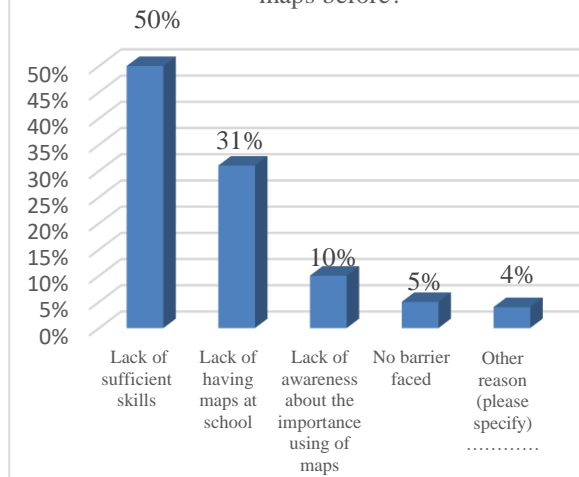


Figure 8 illustrates that 80% agreed with the lack of enough skills to utilize maps and having maps at schools. However, a small number replied “Lack of awareness about the importance of using maps” so they said there are not special maps that are required for low vision people until now in Kurdistan. Participants mentioned that they do not know how to use maps and expressed why it’s important to use maps and that there is no special person to train them. Only 5% chose “No barrier to face”. Additionally, 4% of respondents noted that there are other reasons related to government such as limited quantity of maps in schools, lack of special equipment for printing maps, and lack of professional personnel to teach them. The most important issue is the governmental law that prevents low vision students from studying maps in both primary and secondary schools.

Figure 8: What are the reasons of not using maps before?



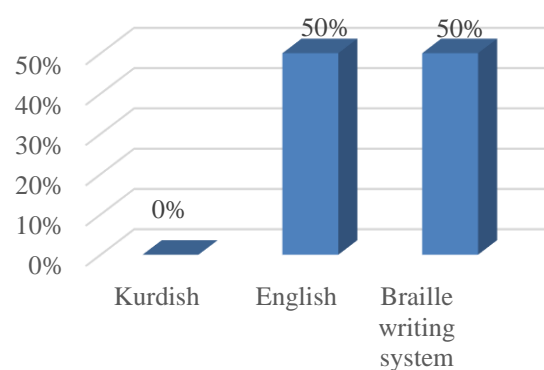
2.2 Findings for Collection and Analysing Data

Data analysis was achieved by partially low sighted students. The answers to the questions below were all related to creating paper maps and were particularly useful for the research. Low vision people were able to access the new technology for using maps at school. All maps were created by using ArcMap, which is one of the main

applications used in GIS. ArcMap symbolises the geographic information as a collection of layers and other elements in a map. All maps produced with ArcMap were included in the respondents answers and the research was conducted among low vision people. All data was chosen to create more appropriated maps for low vision students in terms of the representativeness of the survey.

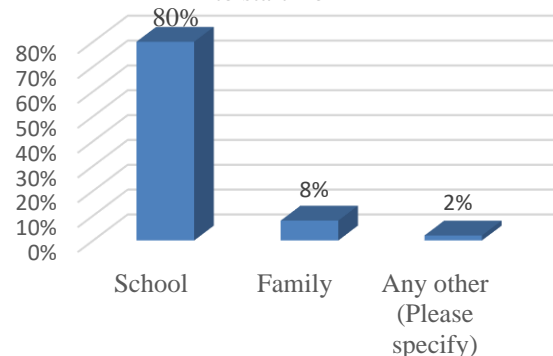
- In order to understand how language influences the performance of maps, it is necessary to understand the process of choosing of languages to include on paper maps. The most favourable language for low partially sighted people is both English and the Braille writing system. They prefer English but the Braille writing system is also acceptable for them. (Figure 9).

Figure 9: Which type of language low Vision people prefer

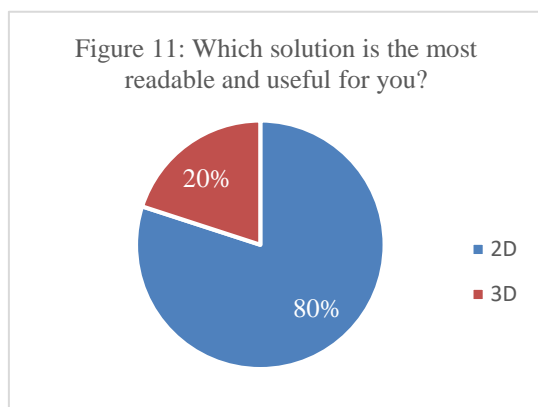


- The aim of this question was to determine the most suitable places for learning information on maps as the first step for low vision students. 80% of the participants in Erbil preferred school and others preferred family for learning and using maps as they do not know anything about mapping as shown in Figure10. Few participants prefer a training centre, which is prominent for students who want to learn mapping. Most low vision people considered the samples to be better than the traditional way of using maps.

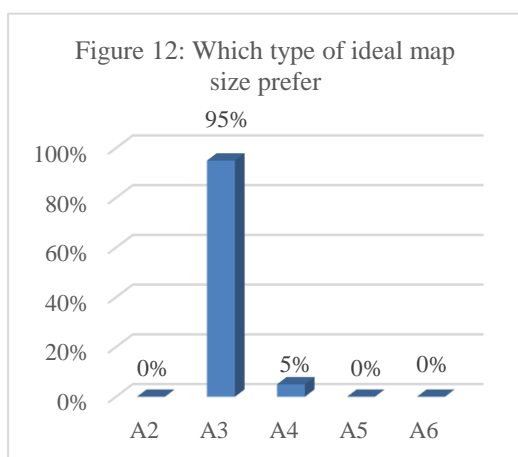
Figure 10: Which place would your prefer to start from



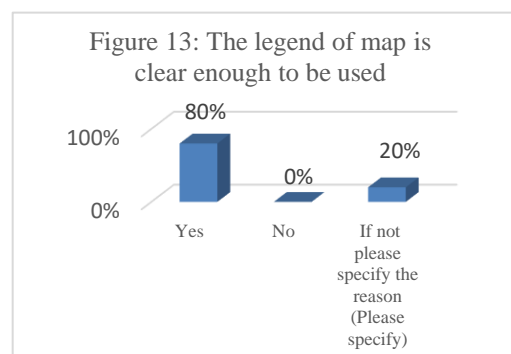
- In questions about which solution is the most useful for presenting maps of the study, 80% of respondents prefer 2D, but 20% of respondents chose 3D, which is also fairly acceptable as it depends on the type of maps they are using. For example, for those maps in relation to the importance of topology and where the Z (elevation, height) values are known, it's better to use 3D. It would be better for researchers of future studies in the area to examine and perform the study in a larger geographical location (Figure 11).



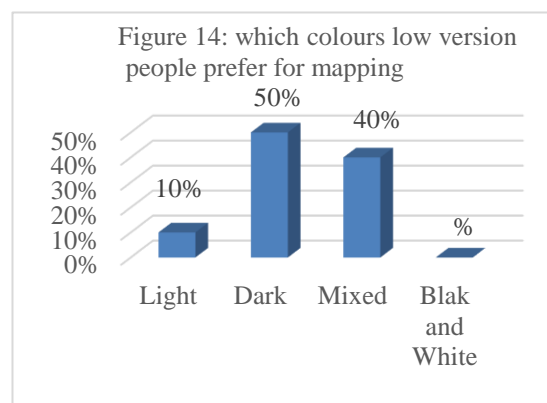
- Low vision people chose gloss paper with black letters against a white background because the paper is shinier and clearer. The size and text are useful due to stronger impulses and the represented samples were satisfied with the new available technology for learning and using maps in school. These students could only see in black and white or in shades of grey.
- Figure 12 shows that both A3 and A4 page sizes were the most suitable and acceptable size for low vision people due to its accessibility and ease. Also, it's important to mention that if maps are used for books, they will prefer A4, but if maps are in an atlas, they will prefer the A3 size. Others are not preferable.



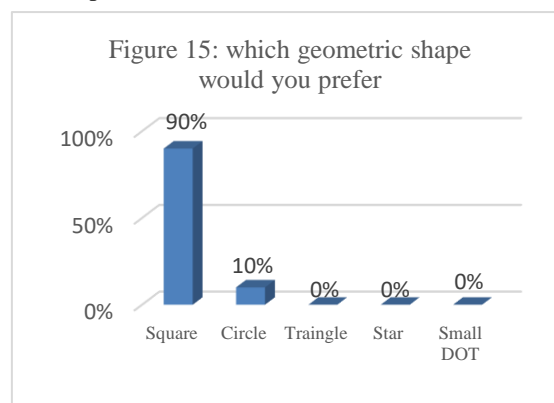
- Figure 13 shows that 80% of low vision students said that the legend of the map is clear enough, but 20% said it would be better if that legend were to be written in English and Braille writing text.



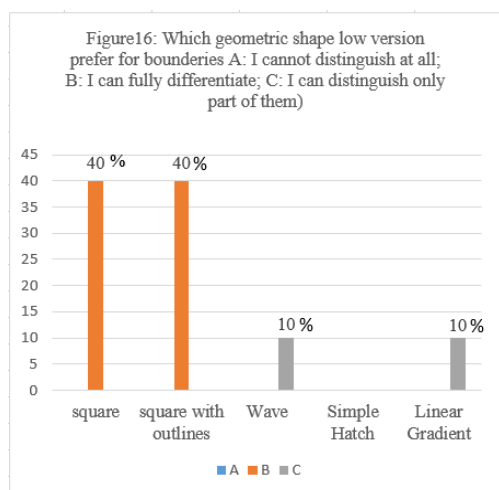
- In relation with the colours used in the sample, low vision students have difficulty seeing all of them. They preferred light, dark and mixed colours with strong contrast, while white and black colours in the map were rejected as shown in Figure 14.



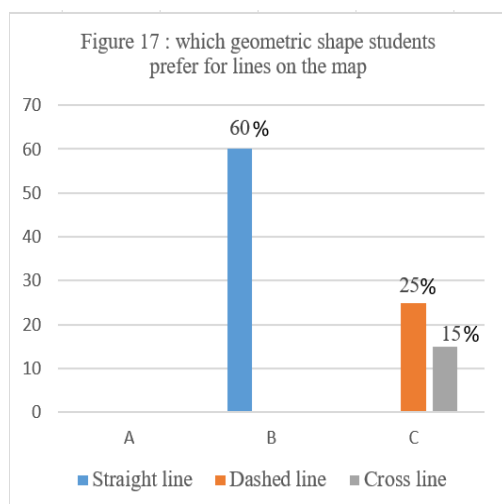
- Geometric shapes used as a symbol: students prefer squares and circles on maps as other options were not chosen (Figure 15). Results show that squares should be used to indicate specific places such as capitals, cities and towns. Circles can be used for sub districts and villages on the map.



- The geometric shapes that have been used to symbolize boundaries on maps were differentiated between squares and squares with outlines. The wave, cross and linear gradient are partially distinguished by participants while the simple hatch is the only type that no one chose. Also, it's important to mention that too much information inside one polygon is not practical for them. Polygons should be clear and simple on the map (Figure 16).



- Concerning to the type of lines on the map, straight lines are more acceptable for them, but they also prefer dashed lines and wavy lines, because they are the easiest to distinguish among all line types by low vision people (Figure 17).



The outcome for part 2 is that all participants hope that these samples will be embedded within their curriculum during their schooling so that they receive the same information as normal students. Also, maps can be a useful tool to gain more benefits in their daily life. Besides that, the samples were encouraging them to research this new technology more to make their daily work easier by getting geographical information about

world. Figure 18 shows two of the samples that the researcher represented to the low vision participants. However, adding the Braille writing system onto maps can be one of the requirements that should be considered in future studies. The final questions in the questionnaire were concluded with different opinions from low vision students. All students requested to add extra maps including: maps of roads in Iraq; maps that use colours to separate provinces in Iraq; and maps that indicate different water sources in Iraq. All maps were used within the school curriculum. They also prefer to create an Atlas with Braille text that can be available in the library.

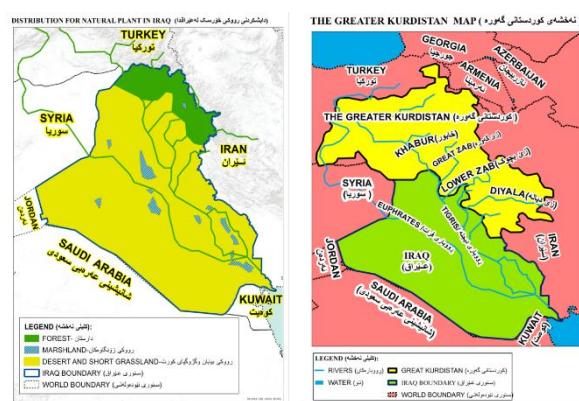


Figure 18: Sample Maps chosen from the representative during survey

3. Conclusion

Summing up, in this research, a questionnaire was performed to find out how people find using digital and paper mapping successful. The study showed that this technology is used by non-professional people widely. Low vision people found that digital and paper maps can help them by giving them a chance to learn about geographical information. The aim is to use, maintain or improve physical ability and skills while providing enjoyment, and in some cases, entertainment for observers. Studying maps are a part of primary school curriculum that requires skills and technology needs that have not been accessible to low vision people until now. In addition, most low vision people know what digital and paper mapping is and do not use it perfectly. 90% of low vision participants in KRG do not know anything about mapping technology. Even though all the participants usually do not use maps, half of them who used digital mapping found it difficult to use. Finally, the research produced some samples with key maps, which were chosen for low vision people and can be used popularly. Moreover, GIS can help the researcher to create maps and support the low vision people to help them and become familiar with using new technologies in their daily life and school. The results of this research show that scholars are trying harder to familiarize low vision people with this technology. Regarding the techniques of the

study, one can note that the sample of the study is just for low vision people in relation to the importance of paper and digital mapping. So, it would be better for researchers of future studies in the area to examine a larger number of blind and low vision people and perform the study in a larger geographical location.

4. References

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