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Statistical reasoning of impact of infographics on education

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Abstract

The aim of this study is to determine students' views about infographics prepared for anatomy lesson. A case study, which is one of the qualitative research method, was used as a model. The participants were the registered students for the anatomy course of the Physical Education and Sports Department (PES) at Near East University. During a six weeks educational period, the study was applied with the participation of 140 students. As a preparation, students have been informed about infographics before the study. Then, the infographics about digestive anatomy was presented to the students under the anatomy course curriculum. At the end of the course presentation, a semi-structured interview form was delivered in order to get students' opinions about infographic and "infographical anatomy" during the course. More than half of the students (n = 74) in the study stated that they did not know the meaning of the word "infographic", and also much more students (n = 84) stated that they had never seen infographics prior to this study. In the end of the study, the students think that more effective visuals are used by infographics instead of traditional course visuals. They also think that the subject of infographics in general is more understandable and more satisfactory. Moreover, since infographics are easier to remain in the minds, they are much more effective. This study has revealed the presentation by infographics can be used in many other courses. By this research, it can be claimed that infographics are not only more effective but also more permanent in the minds. This teaching method can transmit information to the increasingly widespread use, and thus, the conventional form of lectures might be possible to transform towards easy understandable courses having much more infographics.

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1. Introduction

Very significant and rapid developments in technology in the information age that we live in has forced us to change not only teaching and learning materials but also learning environment. This improvement and growth of information technology required new approaches used in education for students and teachers. The new situation really forced educators and instructors for reshaping of the methods and techniques used in the academic environment.

Depending on above developments, beyond the skills like ability to use technological tools, understand and remember the knowledge, today we also expect that students should have some new abilities such as accessing information, configuration knowledge, active participation in class, creative and critical thinking, interpretation what he/she sees, creating different materials and using ability of them for the course.

We know that material selection according to the student's feature is also an issue of interest to instructional technology. To be used for educational purposes, the selection of appropriate materials is very important. Due to the rapid increase of information, instructional technology interests in not only "How to be taught?" question but also the questions of "Without losing too much time, how to be taught the skills and knowledge required to be transferred?", "What resources are available for this purpose in the course?", "How can we enrich learning environments?", "How can we give learning skills to the students?", and "What materials can increase student motivation?". In other words, the whole essence of these questions is what materials and how they will be transferred effectively to the students. At the same time, however, it is expected that the student should be a high level of visual literacy, and his/her communication must be strong enough to understand symbols and text effectively⁷. Based on continuity effect of visual information on learning, information can also be transferred students in different ways such as a configured presentation method supported visual materials or providing configured materials to be used effectively by students.

Visualization that is supporting by visuals is one of the most frequently used method in the teaching-learning process. By visualization, students get an opportunity to make visible their idea, to think on the meaning established, to organize its own thinking process². Or in other words, visualization of information is a method that allows it to become more visible and create meaning in student's mind. Thus, student can configure, organize and edit information in this process. By this method, information can be used by many people and increase its accessibility⁵. Students can get negotiable and manageable information by information visualization. Main purpose is not to give just a graphical map data but to transfer required actual knowledge, to keep in mind or make it more easily remembered.

In order to visualize many tools are used such as concept maps, graphic organizers, flow diagrams, simulations, pictograms etc⁷. Borkin et al studied on visualization types and relationship with memory level. They claimed that visuals containing pictogram may be remembered better than other visual means and moreover infographics are the highest level recalling type of visual means¹.

Infographic can be seen as an extremely useful material for information transfer that can be used for transferring of complex or high amounts of information. Especially in the long text, important figures and important numerical data may be overlooked. For this reason infographics will provide to be noticed of those data. That is long and complex information transform to simpler and understandable knowledge. This peculiarity makes it significant presentation instrument not only in education but also in every field in the life. Nowadays in digital technology, information and visuals continuously and rapidly growing both in academic platforms and social media. Thus the influx of information makes infographics much more significant.

Infographics are also transferring complex information effectively of the economical data by visual analysis⁸, and also support the improvement of students³. Learning by using infographics, provide a lot of data as a whole structure for individuals and thus, they create scheme in minds^{9,6}. In other words, they are carried out in a clear and visual presentation of complex data quickly. This data visualization is also called information architecture or information graphics^{4,11}. In terms of graphic design infographic "information design" and to meet the needs of the target audience, message analysis, planning, presentation covers and understanding¹⁰.

The most distinguishing feature of infographics from other types of visualization, no matter how intense and complicated to understand the requested information to be transmitted, is to provide a layout of this information and to teach it in the simplest form. Infographics are significant tools for learning because they include the design

elements about content context such as maps, tables, diagrams, etc. Also, they can benefit from the graphical elements such as typography, color, etc. Moreover, they can be used for more comprehensive design elements and graphic elements⁸.

According to the results of Yıldırım and his colleagues' study which made in order to determine learners' views on using and creating infographics, all the participants had seen infographics first time but yet they liked them because they could present visual data as more systematic and orderly manner than other visual materials. They assessed that infographics are more useful both in preparation and presentation¹⁴.

Infographics used in the educational purposes and even used as lecture notes are often shared recently in the digital environment, particularly in the social networking environment. However, it appears that there is no so much study about infographics when an investigation is made in the literature. If Infographics have a teaching-learning process and emerge as a new material that can be used in courses, new studies on infographics in educational sense must be made. Visualization of information by using the methods and technologies in learning environment concerns basically provision of learning and determination of the learner performance. Anatomy is perceived as difficult course by the students since being heavy information based on memorization. During the anatomy course they have to take a lot of and intensive information every week. Apart from amount of content, transfer process of this information in the course is generally problematic. Because of all these reasons, achievement of anatomy became very difficult for the students.

In order to solve the failure problem of students in the course, infographic designs of anatomy may be one of the effective ways offered. In this study, another reason of the preparation of infographics in anatomy, is the anxious level of the students. Indeed anatomy was the most concerning lesson for them as it was very difficult to pass the anatomy lesson. Infographics to eliminate these problems, there have been frequently referenced materials. Yet evaluation studies about infographics are very rare in the literature eventhough they have a wide audience on the internet media. Though infographic design is difficult, they become effective and efficient visualization products as long as they are developed according to design principles.

In this respect, evaluation of infographics developed for anatomy course will be significant in terms of using in educational environments. With reference to this matter, the aim of this study is to determine the opinions of students about prepared infographics for class activities and courses. Determination the views of teacher candidates about infographics prepared for educational purposes will provide a valuable information for infographic material designers.

2. Research Objectives

In this study, some infographics about digestive system are prepared as a part of the curriculum of the anatomy course. The students perceive anatomy as very difficult. To determine students' opinions about infographic materials is the objective of this study. The study was prepared under the following sub-problems such as;

- 1- What is the participant's gender?
- 2- Do you know the meaning of infographics?
- 3- Have you ever seen before infographics?
- 4- Do you think it is advantageous compared to other visuals Infographics?
- 5- Are infographics helped you better understand the issue?
- 6- Do you think to utilize infographics while you are preparing the course or the exam?
- 7- What is your view for infographics?
- 8- According to you, what are the advantages of infographics?
- 9- According to you, what are the disadvantages of infographics?

3. Methodology

3.1. Working group

This study was conducted during the fall semester of the 2015-2016 academic year. The universe of study is a total of 140 students enrolled "Human Anatomy and Kinesiology" (BSÖ-105 coded) course in the Physical Education and Sports Teaching Department (PES) at the Near East University (NEU).

3.2. Research Model

In this research, case study as a model of qualitative research methods was used. In a case study model, the factors related to a case (environment, individuals, events, processes, etc.) are investigated through an integrated approach, and thus, it is focused on the status of the case that how those factors impact it¹³.

3.3. Data Collection Tools

As the data collection tool, a "semi-structured interview form" prepared by the researchers to determine the views of the students about the infographic course materials related with digestive system was used. The data collection form including demographic information and infographic subjects consists of 9 questions in total. The first seven of questions are multiple-choice question; the last two questions are formed as open-ended questions. The answers of the students were evaluated and classified. Before performing, the interview form has been prepared in consultation with 10 experts.

3.4. Application

The applications involving the digestive system performed within the scope of the subject anatomy course lasted six weeks. The first two weeks, students are given information about infographics and developed infographic designs in general. These training activities were repeated at the beginning of class each week. During the application process, the most difficulty topics were determined by faculty member of the course and researchers. To help students as visually, then, infographic designs within the scope of the issues were created. Considering a good infographic preparation process, different infographics for each course are prepared. These different infographic designs prepared for the anatomy lesson was presented to students every week. The last week of the application, the data collection form was delivered to students and asked to complete it.

3.5. Data Collection

The data is collected from the students of PES enrolled "Human Anatomy and Kinesiology" course in the fall semester of 2015-2016 academic year at Near East University. Interviews to each participant were made at the end of the course. In the interview, the questions about infographics have been asked by Data Collection Form and it was asked to fill out these forms by participants.

3.6. Data Analysis

The content analysis was performed for the data obtained by interview forms. Content analysis is achieved using the combined data and interpretation of concepts and themes by editing them¹². Similar data were obtained primarily from all the data in certain contexts and tried to gather, and then they are categorized in a way that can be understood easily by the reader. The findings were established as common codes and themes being used in the analysis.

3.7. Validity and Reliability

Data were gathered during interviews at the end of each course. The data collection tool has been developed by the views of 10 experts in the field. Furthermore, description of the methods and the implementation of study clearly contributes its validity and reliability.

4. Results

This section includes the research findings gathered by Data Collection Form.

4.1. Gender of participants

There were 140 participants in the study and 130 (92.9%) respondents were male and 10 were (7.1%) female.

4.2. Do you know the meaning of the word "Infographics"?

After giving a brief overview about infographics for the participant students, the subject of anatomy course was presented to students by infographics. At the end of the first course presentation to determine the current infographic knowledge of the students, the question "Do you know the meaning of the word infographics?" was asked. As shown in Table 1, 52.9% of students did not know the meaning of the word infographics. The proportion of students who know the meaning of infographic was 47.1%.

Table 1. Do you know the meaning of the word "infographics"?

	f	%
Yes	66	47.1
No	74	52.9
Total	140	100.0

4.3. Have you ever seen infographics before?

Another question asked students to measure the information about the current infographics was "Have you ever seen infographics before?". As shown in Table 2, 54 students (38.6%) answered "Yes", and 86 (61.4%) students answered "No" for this question.

Table 2. Have you ever seen infographics before?

	f	%
Yes	54	38.6
No	86	61.4
Total	140	100.0

4.4. Do you think that infographics have advantages compared to the other visuals in other courses?

As indicated in Table 3, 82 participants (58.6%) answered this question "Yes", while 54 participants (38.6%) answered "No idea". Just 4 respondents (2.8%) answered this question as "No".

Table 3. Do you think that infographics have advantages compared to the other visuals in other courses?

	f	%
Yes	82	58.6
No	4	2.8
No idea	54	38.6
Total	140	100.0

4.5. Did infographics help you to understand better the issue?

To measure whether students understood better the subject matter described by the infographics, the question "Did infographics help you to understand better the issue?" was asked. As shown in Table 4, the vast majority of

students such as 121 (86.4%) answered "Yes". But 11 respondents (7.9%) answered as "No" while 8 respondents (5.7%) answered as "No idea".

Table 4. Did infographics help you to understand better the issue?

	f	%
Yes	121	86.4
No	11	7.9
No idea	8	5.7
Total	140	100.0

4.6. Do you think to utilize from infographics when you prepare for any course or exam?

In order to determine students' thought about preparation to exam with infographics, the question of "Do you think to utilize from infographics when you prepare for any course or exam" was asked to the participants. As indicated Table 5, 88 of the students (62.9%) answered as "Yes", 9 students (6.4%) answered as "No", and 43 students (30.7%) answered as "No idea".

Table 5. Do you think to utilize from infographics when you prepare for any course or exam?

	f	%
Yes	88	62.9
No	9	6.4
No idea	43	30.7
Total	140	100.0

4.7. What do you think about infographics?

By this question, it is aimed to be learned whether students has a positive or negative view about infographic. As shown in Table 6, 106 (75.7%) students declared positive view, 6 students (4.3%) declared negative view, and 28 (20%) participants had no idea about infographics.

Table 6. Distribution of thoughts on infographics

	f	%
Positive	106	75.7
Negative	6	4.3
No idea	28	20.0
Total	140	100.0

4.8. What are the advantages of infographics for you?

The question, "What is the advantage of infographics, according to you?" was asked to participants. 29.3% of them stated that infographics have better and more descriptive visuals. 16.4 % of the students stated that learning the subjects with infographics are more permanent in mind. The percentage of students who think that course presentations became more understandable is 10.7%. The rate of those participants who state that to make examination on infographic figures and visuals comfortably during course presentation is 4.3%. Interestingly, in this study, even if the percentage of the students having positive thought for infographics is very high, they did not make clear explanations or have no idea about advantages of infographics. These students' percentage is 39.3% (Table 7).

Table 7. What are the advantages of infographics for you?

	f	%
Better visual	41	29.3
More memorable	23	16.4
More understandable	15	10.7
Having examination chance	6	4.3
No idea	55	39.3
Total	140	100.0

4.9. What are the disadvantages of infographics for you?

The question, "What are the disadvantages of infographics for you?", was asked to all participants. As shown in Table 8, the rate of students who state that there is "no disadvantage" of infographics is 48.5%. The proportion of students having no idea is 39.3%. On the other hand, 5 % of the students stated that the presentations by infographics were made very fast; and therefore, it was difficult to understand. Some participants (4.3%) found that the presentations having infographics were confusing. Few participants (2.9%) thought that the lectures including infographics are "wasted time".

Table 8. What are the disadvantages of infographics for you?

	f	%
No disadvantages	68	48.5
Making fast presentation	7	5.0
Confusing	6	4.3
Wasted time	4	2.9
No idea	55	39.3
Total	140	100.0

5. Discussion and Results

Today infographics are becoming widespread and being used by many different sectors and organizations. Also its variety of topics is increasing. In this small study about infographics, we focused on the issue that either infographics are suitable as a teaching material in the courses or not. After infographic presentations under the course curricula, some questions were asked to students. We got interesting conclusions obtained by these nine questions within the scope of the study to evaluate this infographic method.

First of all, this research shows us that the students do not know much about infographics in general. Moreover, as shown in Table 1, more than half of the participants (52.9%) answered that they did not know the meaning of the word "infographics" before the study. Similarly as shown in Table 2, a larger part of the participants (61.4%) stated that they had never seen infographics before the study.

Secondly, the participants were satisfied with infographic presentations of the course subjects. As seen in Table 3, 58.6% of respondents think that infographics have more advantages than the other visuals have. The rate of saying "No idea" for either being advantages or not is 38.6 %. This high ratio shows that the students need to experience and practice with infographics. Another result about satisfaction of students on infographics is shown in Table 4. The rate of answer "Yes" to the question of "Did infographics help you to understand better the issue?" was 86.4 %. Based on these high-scoring results, we can say that there is a high level of satisfaction for the students in general about infographics. According to Table 6, students were generally positive attitude to lectures with

infographics. Indeed, as a large proportion of the students participating in the study such as 75.7% have positive thought about infographic while 20% has "no idea" about its positivity.

Thirdly, even though the most of students think positive about infographics, a significant proportion of them (38.6%) were still undecided about their advantages as shown in Table 3. Actually, this rate seems high and confusing enough. May be the students had not faced enough with infographics and had no so much experience about usage of them, and possibly for these reasons, they were undecided.

Fourthly, the participants are ready for studying course or curriculum subjects with infographics. According to the Table 5, the majority of the participants (62.9%) consider working and preparation with infographics for exams or courses. A high percentage (30.7%) of them again has no idea for working or preparation with infographics. This high rate of undecided participants shows that they don't dare to work with infographics. The reason of this may have been due to lack of experience with infographics before.

Finally, the Table 7 and Table 8 prove that using infographics in official courses or in curriculum will provide significant advantages to the students. According to the study, the students think that while taking course with infographics has no serious disadvantages, it provides better visuals (more memorable and understandable materials) having enough and important course information for them.

Regarding the results obtained from these findings, it could be claimed that infographics can be used as a course material in all other challenging lessons. This research puts that the conventional presentations in courses made by PowerPoint pages method may be abandoned; and instead of it, by infographics, a more effective presentations providing more permanent information may be possible and widespread in time.

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