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Geliştirilen Etkileşimli Elektronik Kitabın Sosyal Bilgiler Dersi Öğretiminde Etkisi

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Öz

Bu çalışmanın amacı alan yazına ve uzmanların görüşüne dayalı olarak etkileşimli elektronik kitap tasarım ilkelerini belirlemek, bu ilkeler esas alınarak altıncı sınıf sosyal bilgiler dersinin bir ünitesi için etkileşimli bir e-kitap geliştirmek, geliştirilen e-kitap ile MEB tarafından yayınlanan örnek e-kitabın öğrencilerin akademik başarısı üzerindeki etkisini karşılaştırmak ve kitaplarla ilgili öğrenci görüşlerini belirlemektir. Bu amaca ulaşmak için öncelikle alan yazın taranmış ve e-kitap tasarımında dikkat edilmesi gereken özellikler belirlenmiştir. Sonrasında sosyal bilgiler alanında uzman öğretmen ve öğretim elemanlarıyla, bilgisayar ve öğretim teknolojileri (BÖTE) alanında uzman öğretim elemanları ve lisansüstü öğrencilerle yarı yapılandırılmış görüşmeler yapılmıştır. Görüşmelerde MEB tarafından hazırlanan kitap değerlendirilerek e-kitabın öğretim açısından etkili bir şekilde tasarlanması için sahip olması gereken özellikler tespit edilmiş ve ilgili alan yazın ile görüşme sonuçları analiz edilerek etkileşimli e-kitap özellikleri belirlenmiştir. Belirlenen özelliklere dayalı olarak etkileşimli bir kitap geliştirilmiştir. Geliştirilen kitap alan uzmanlarının görüşüne sunulmuş ve kitaba son hali verilmiştir. Kitaplar, eğitim ortamında basılı kitap yerine kullanılarak öğrencilerin akademik başarısına etkisi belirlenmiştir. Öğretim süreci sonunda öğrencilerin kitaplara yönelik görüşleri alınmıştır. Deney ve kontrol gruplarının genel başarı testi ve başarı testi bilgi düzeyi puan ortalamaları arasında anlamlı bir farklılık görülmezken, başarı testi kavrama düzeyi puan ortalamaları arasında anlamlı farklılık görülmüştür.

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The Effect of the Developed Interactive Electronic Book on Social Studies Course Teaching

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Abstract

The aim of this study is to determine the principles of interactive electronic book (e-book) design based on the literature and the opinions of experts, to develop an interactive e-book for a unit of the sixth-grade social studies course based on these principles, to compare the effect of the developed interactive e-book on the academic success of students with the sample one published by the Ministry of National Education (MNE) and to determine the opinions of the students about the books. In order to achieve this aim, first of all, the literature was surveyed and the features that should be considered in interactive e-book design were determined. Afterwards, semi-structured interviews were conducted with teachers and instructors who are experts in the field of social studies field, instructors and postgraduate students who are experts in the field of computer education and instructional technologies (CEIT). So thus, the interactive e-book features were determined by analyzing the relevant literature and interview results. Based on the defined features, an interactive book was developed. The effects of the e-books on the academic achievement of students were determined by using the e-books instead of printed books in the educational environment. At the end of the teaching process, students' opinions about the e-books were taken. While no significant difference was reached between the general achievement test and the achievement test's knowledge level mean scores of the experimental and control groups, there was a significant difference between the achievement test's comprehension level mean scores.

Keywords

Electronic Book, Interaction, Material Development, Social Studies

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Introduction

The continuous development of technology brings along different investigates in the field of education. Especially, the tools used are not sufficient in the educational environment, and new materials are needed. One of these materials is e-books.

E-books emerged with the transfer of printed books to electronic media in the 1990s (Gregory, 2008; Ihmeideh, 2014). In the following years, the contents were connected via bridges and enriched with multimedia (Bodomo , Lam, & Lee, 2003). Many objects such as video, audio, animation, games, and evaluation tools can be integrated into the e-book (Serevina, Astra, & Sari, 2018; Silalahi, 2020; Lieung, Rahayu, & Yampap, 2021). E-books turn into interactive e-books with the added multimedia objects. Thus, the features of interactivity and customizability are added to the advantages of the e-book (Lieung et al. 2021). Portability, continuity, updateability, ease of access, interactivity and customizability are some features of interactive e-books (Bodomo , Lam, & Lee, 2003; Soules , 2008, Lieung et al. 2021).

The advantages of e-books can be listed as follows:

- Providing interactive environments through multimedia elements,
- Ability to search within the content,
- Most have dictionaries,
- Adjusting the font size of texts,
- Providing facility to visually impaired readers with its voice-over feature,
- Easy to update
- It can be easily shared,
- Making it easier for authors to promote their works,
- Compared to printed books, its publishing process is faster, the printing costs are eliminated and access is cheaper,
- It can be read easily in the dark and without disturbing others, thanks to laptop computers or e-book reader devices,
- It is environmentally friendly.

The disadvantages of e-books can be listed as follows:

- The lack of an international standard in the design of e-books is an important obstacle to the design of qualified e-books. As a result of this, e-books are developed in incompatible formats with one another.

- A content problem is experienced due to the lack of sufficient e-books for education.
- Various security problems are experienced because of the internet environment (unwanted access, lack of security, etc.).
- Due to the absence of a professional e-book publishing; publication, promotion, and marketing must be done entirely by the authors.
- It can occur that various health problems when long-term reading is done (Öngöz, 2011a).

So that an e-book to be developed can include the mentioned advantages, there are some features that should be considered in the design and presentation of its content. However, the e-book is a new material and there are no accepted rules in its design.

In the studies, it was tried to determine the features that e-books should have in order to be prepared effectively. It is stated that there should be a table of contents, the multimedia objects should be added, the multimedia objects should be related to the content, and the content should be able to present to the user clearly (Landoni, Wilson & Gibb, 2000; Öngöz, 2011b; Silalahi, 2020; Lieung et al. 2021). Interactive e-books appeal to different senses with the addition of multimedia objects. With this feature, it can be used in various areas. Additionally, different reading opportunities can be provided to various age groups (Üstündağ & Akdenizli, 2022). The multimedia objects are important to be riched an e-book (Silalahi, 2020; Lieung et al. 2021). The e-books can be interactive via these objects. However it is indicated that the multimedia elements in the e-book should be compatible with each other, and it should be taken not to use different structures on the same page (Landoni et al., 2000; Hillesund, 2001). It is stated that e-books should have the features of printed books. Features such as underlining and note-taking should be possible, and there should be links within the texts (Shirratuddin, Landoni, Gibb & Hassan, 2003).

Wilson and Landoni (2002) carried out the EBONI project that covers approximately 100 students, faculty members, and researchers between 1999 and 2002 by benefiting from the results of dozens of scientific studies. Within the scope of this project, they published a guide material called "Design Principles of Electronic Textbooks", which explains the principles required for learning material to be named an "e-book". These principles are listed as follows:

1. It should be a book cover.
2. There should be a table of contents listed all chapters in the e-book.
3. In the table of contents, links should be given to the relevant places in the e-book.
4. A search tool for searching within the e-book should be developed.
5. No link should be given to any source other than the e-book.
6. Pages should be designed similar to real paper pages, read through the scroll bar.
7. If a dictionary is used, it should be given separately from the main text.
8. There should be a standard color scheme for all links.
9. The icons' visuals should reflect the feature of the connected place.
10. One page should not contain too much text. Paragraphs should be kept short.
11. Indicators should be used so that the user can understand which part of the book they are in. These indicators should be noticeable, but not distracting.
12. It should be allowed to change the writing characteristics. The use of italic fonts should be avoided.
13. The same color should be used for texts of the same type. A plain background should be preferred. A text color that does not get lost in the background color should be chosen.
14. Figures should be interspersed in the text.
15. The texts should be enriched with elements such as pictures, figures and formulas. Elements other than text should be centered so that they appear separately from the text.
16. Interactive elements should be included. Textual information about the items used should be given. (Öngöz , 2010; Hatipoğlu, 2011).

Studies aiming to determine e-book preparation formats have also been carried out. In 1999, NuvoMedia and SoftBook Pres together made a proposal for the e-book publishing structure, called Open eBook Publication Structure (OEBPS). OEBPS based on Hyper Text Markup Language (HTML) and Extensible Markup Language (XML), was supported by more than 200 companies including IBM, Microsoft and Adobe. But over time, each company has focused on making its own e-book format. For example, Adobe company has tended to use Portable Document Format (PDF) format. Microsoft has gone on to produce extensions that can be used in M.Word and documents in HTML format and

later developed the LIT format, which is also supported by OEBPS. As a result of this, there are different types of e-books today (Öngöz , 2010).

In Türkiye, a project was initiated by MNE in 2011, aiming to give students the habit of reading e-books. According to the project, e-books will now replace printed books in schools. Within the scope of the project, “Sixth Grade Social Studies Student Textbook” was presented as a sample book (MEB, 2012). The features of the sample e-book that overlap with the advantages of e-books, which are revealed when the relevant literature is scanned, are as follows: presenting the content to the students in sub-headings, including the menus, using the learning objects, including the visual materials and the dictionary, switching between the pages with the back and forth button. However, it is seen that it does not include some features determined by surveying the literature and this situation may turn into disadvantages that may negatively affect students. Some of these disadvantages are the use of visual objects that may distract students, the low resolution due to scanning the sixth grade social studies book and transferring it to the electronic environment, the difficulty of switching between subjects, and the different structures of the learning objects. In addition, the sample e-book prepared has brought along some concerns about relevance in terms of the suitability of the design, the opinions of the field experts about the book, and the suitability for the course.

In the light of all this information, the main purpose of this study is to determine the principles of interactive e-book design based on the literature and the opinions of experts, to develop an interactive e-book for one unit of the 6th-grade social studies course based on these principles, to compare the effect of the developed interactive e-book and the sample e-book by MNE on the academic achievement of students, to determine the opinions of the students about the books.

Materials and Methods

This study was carried out in 2012-2013 academic year. The semi-structured interviews were conducted with teachers and instructors who are experts in the field of social studies, instructors and postgraduate students who are experts in the field of CEIT in order to achieve the aim of the study. In the interviews, the sample e-book prepared by MNE was evaluated and the features that should be in the interactive e-book were determined. After analyzing the relevant literature and interview results, interactive e-book design principles were determined. Based on these principles, an interactive e-book was developed for a unit of the sixth grade social studies course. The field experts' opinions were taken about the developed interactive e-book and the interactive e-book was given its final form. In order to determine the effect of the e-books on the academic achievement of the students, the developed

interactive e-book in the experimental group and the sample e-book of MNE in the control group were used instead of the printed textbook in the teaching environment. At the end of the teaching process, students' opinions about the books were taken. In this section, information about the research method, the models used in quantitative and qualitative dimensions, the study group, data collection tools and analysis methods are given.

1. Research Model/Pattern

In this study, a mixed model integrating quantitative and qualitative research methods was used to better understand the research problems (Fraenkel & Wallen, 2008). Qualitative, quantitative and qualitative approaches were used, respectively. The design of the research is presented in Figure 1:

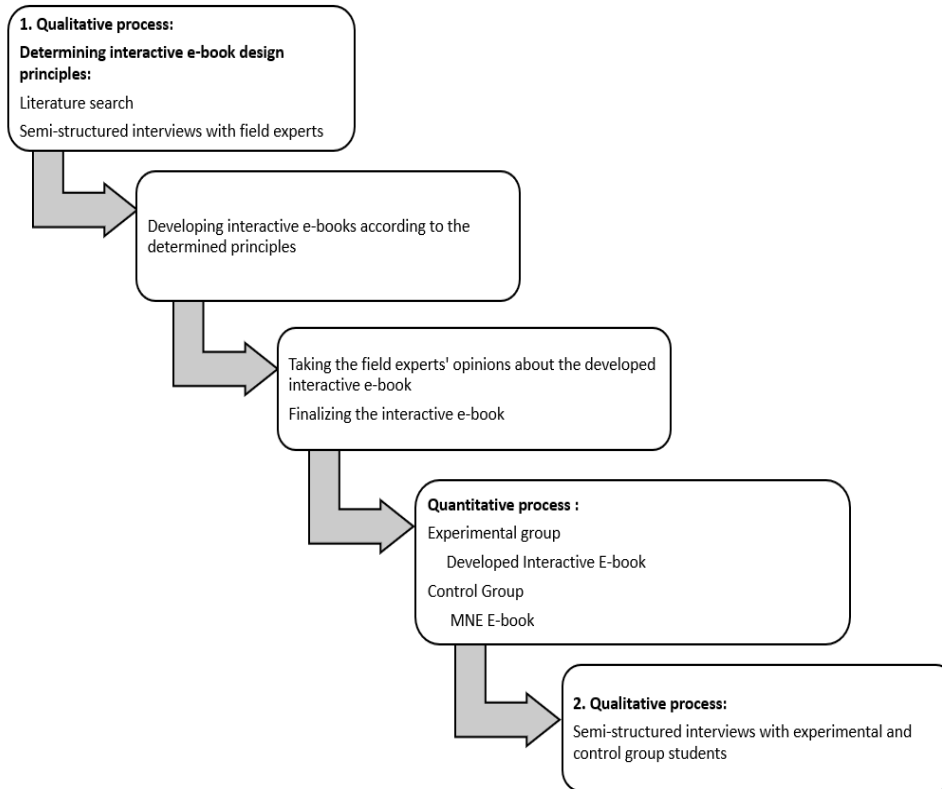


Figure 1.
Research Design

1.1. Identifying Interactive E-Book Design Principles

In order to provide cooperation in the teaching process, to determine the interactive e-book features and to determine the opinions about the e-books, five instructors in the field of social studies, four instructors in the field of CEIT, four social studies teachers working in schools affiliated to MNE, and five postgraduate students in the field of CEIT. Semi-structured interviews were conducted with the students individually.

1.1.1. Interview Questions

After examining the question types in the literature and the features that interview questions should have; for the evaluations of both social studies experts and CEIT field experts, two interview forms were developed to evaluate the sample e-book published by MNE and to determine the principles of interactive e-books, and two interview forms were developed to evaluate the developed interactive e-book. The opinions of two experts about the prepared forms were taken and the interview forms were given their final form. The interview form prepared for social studies field experts consists of 12 closed and two open-ended questions, a total of 14, and the interview form prepared for CEIT field experts consists of a total of 28 questions, including 26 closed and two open-ended questions.

1.1.2. Analysis of Interview Data

Content analysis method was used to analyze the interview results. First of all, a general framework was created by scanning the relevant literature. In line with this general framework, categories were determined by coding on the raw data. The new data that emerged according to the results of the interviews were added to the frame.

1.2. Development of Interactive E-Book

Based on the interactive e-book design principles determined as a result of the scanning of the relevant literature and the analysis of the interviews, a book covering one unit of the social studies course was developed. Adobe Dreamweaver, Flash and Photoshop CS6 programs and Action Script 3, JavaScript and PHP programming languages were used in the internet-based developed book.

1.3. Determining the Effects of E-Books on Student Success

In order to determine the effects of e-books on students' academic achievement; experimental design with posttest control group was used. This design was chosen because the trial lasted as little as three weeks and it is thought that the pretest may affect the posttest scores.

1.3.1. Study Group

The study group of the research consists of 55 students studying in two sixth grades at a primary school in Nevşehir, Türkiye. Two classes, one of which is the experimental group and the other is the control group, were determined by unbiased assignment. As 5 out of 27 students in the experimental group and 4 out of 28 students in the control group did not participate in the post-test, they were excluded from the study group, and 22 students in the experimental group and 24 students in the control group were processed.

1.3.2. Achievement Test

Among the academic achievements of students, an achievement test was developed to determine the difference. During the development phase of the test covering all the objectives in the unit and questions at the knowledge and comprehension level of the cognitive domain taxonomy, a 50-question test was created with four social studies teachers by collecting questions from various sources (questions from branch teachers, related test books, etc.).

Opinions of an assessment and evaluation expert, two social studies instructors and six social studies teachers were consulted about the created test. Apart from the experimental and control groups, the prepared questions were read to two sixth-grade students, and the clarity of the questions was checked. Some questions were removed and some were corrected, taking into account their suitability for the social studies curriculum and student structure. At the end of this process, a valid test consisting of 40 multiple-choice questions with four options was made ready for pilot application.

The pilot application was applied to 78 seventh-grade students in the school where the study was conducted. Total scores were calculated so that each question in the test was worth '1' point, and item analysis regarding the test items was made. With item analysis, the questions in the test were evaluated according to their difficulty and discrimination. As a result of the evaluation, the discrimination index of the questions in the test ranged between 0.33 and 0.76, and the difficulty index ranged between 0.33 and 0.69. The average difficulty index of the test was measured as 0.48. To measure the internal consistency of the test, the Kuder Richardson-20 (KR-20) value was calculated and found to be 0.93. In this case, it can be said that the achievement test created is quite reliable. The test which validity and reliability were determined consists of a total of 27 questions, 11 of the questions are at the level of knowledge and 16 of the questions are at the level of comprehension.

1.3.3. Teaching Process

Before starting the teaching process, information technology (IT) classes in schools in Nevşehir were examined and it was researched which ones could meet the requirements of the experimental dimension of the research. Afterward, the schools where the hours of the social studies course and the hours of the IT class matched were searched and the school where the teaching process would be carried out was decided. At the beginning of the process, a 40-minute course was given to the students on how they can benefit from the books, a 30-minute explanation was given to the relevant teacher, including the use of the books and the teaching process.

The teaching process lasted three hours a week for three weeks in the computer laboratory. The teacher treated the relevant unit like the other units. The only difference is that instead of printed books, the students in the experimental group used the developed interactive e-book, while the students in the control group used the MNE sample e-book from the computer by accessing their internet address. At the end of three weeks, an achievement test was applied to the students.

1.3.4. Analysis of Data

Since the number of students in the experimental and control groups was less than 30 in this study, it was decided to use a parametric statistical method if the variances were homogeneous and the data showed a normal distribution. The Kolmogorov-Smirnov (KS) test was used to determine the normality of the distribution, and the Levene test was used to determine the homogeneity of the variances. As a result of the tests, it was found appropriate to use the parametric statistical analysis method. Quantitative data collected were analyzed by using the independent samples t-test.

1.4. Student Opinions about the E-Books

Semi-structured interviews were taken individually in order to get the opinions of the students about e-books. 14 students from the experimental group and 10 students from the control group voluntarily their opinions.

Interview Questions: The interview form prepared for students consists of a total of seven questions, six of the questions are closed and one question is open-ended. After examining the question types in the literature and the characteristics that the interview questions should have, the interview form was prepared, and the interview form was given its final form after the opinions of two experts were taken.

Analysis of Interview Data: Content analysis method was used to analyze the interview results. The new data that emerged according to the results of the interviews were presented by categorizing.

Findings

1. Determining Interactive E-Book Design Principles

Interviews with Social Studies Field Experts: The results of the interviews with social studies field experts in order to evaluate the MNE sample book and to determine the features that an interactive e-book should have in the field of social studies are given in Table 1. Results are given as frequency (f) and percentage (%). Unnumbered questions were answered if the answer to the previous question's answer was "YES".

Table 1.

Analysis Table of Closed Ended Interview Questions with Social Studies Field Experts

Question No	QUESTIONS	YES		NO	
		f	%	f	%
1	Does the electronic e-book have a cover?				
	Is a suitable cover designed for the e-textbook?				
	Does the cover have a book title to reflect the content?			9	100
	Is the author name information on the cover sufficient?				
2	Does the cover have a link to the "Contents" section?				
	Is the amount of text used on the pages sufficient?	2	22.3	7	77.7
3	Does the content contain meaningful headlines and subheadings?	9	100		
4	Are the expressions in the content understandable?	9	100		
5	Is the font and size used appropriate for the target group?	7	77.7	2	22.3

6	Is the transition between pages evident?	66.6	3	33.4
	Multimedia elements (sound, picture, graphic, table, photograph, video, animation, simulation, etc.) embedded in the text?	9	100	
	The multimedia elements appropriate for the student level?	9	100	
7	The multimedia elements related to the content on the page they are used on?	5	55.5	4 44.5
	The multimedia elements appropriately positioned within the text?	9	100	
	Are the explanations given about the multimedia elements sufficient?	2	22.3	7 77.7
	The multimedia elements interactive?	2	22.3	7 77.7
8	Do students have the option to listen to texts with audio?		9	100
9	Do the symbols (icons) used reflect the characteristics of the destination?	4	44.5	5 55.5
10	Are links in the main texts to outside the e-book?	9	100	
	Are the links used appropriate?	3	33.4	6 66.6
11	Is there a "Contents" section with relevant links in all main and sub-headings?	9	100	
	Is it easy to access?	4	44.5	5 55.5
12	Is there a "Dictionary" tool?	9	100	
	Is its presentation appropriate?	3	33.4	6 66.6

In addition to the closed-ended questions, the open-ended questions which are “What are the deficiencies you see in the e-book, apart from the questions asked?” and “Are there any other features that you think an interactive e-book should have? If so, what are they?”, were asked. The answers of the open-ended and closed-ended questions are given below.

As a result of the interview, instructors and teachers pointed out that the sample e-book did not have a cover page, the publication date of the content was not specified, instruction on how to use the e-book was not given, and therefore its use was confusing for 6th-grade students. They stated that the expressions used and the presentation of the main and sub-titles were understandable since the content was created by scanning the MNE social studies printed book. However, they indicated that the inability to change the font size of the scanned content and the underlining or crossing out features of

the texts may cause the student to not be able to adopt the book and concentrate. They specified that the amount of text used on the pages is too much, so the area where the content is presented could not be used effectively. They also stated that it is more appropriate to give only one topic on a page. They indicated that the texts did not have a user-controlled voice listening option. They indicated that the "Contents" tool did not include all of the main headings and subheadings in the e-book. It is specified that it is not correct to name the learning objects as learning objects given in the e-book. Practice, exercise, game, etc. suggested that nomenclature could be used instead of the learning object. They indicated that the content of the links placed in the e-book was not sufficient and that some of the links contain advertisements, so this situation may distract students from the subject. They specified that it was not correct to connect the "TDS Dictionary" menu used in the e-book to the Turkish dictionary on the official website of the Turkish Language Society (TDS), it would be more appropriate to use the terms dictionary in the MNE social studies book instead of TDS Dictionary. They indicated that there should be a search feature in the e-book. In addition, the teachers emphasized that they had students take notes on the subject during the lesson and therefore students should have an area where they could take notes.

Interviews with CEIT Field Experts: In order to evaluate the MNE sample e-book and to determine the features that an interactive e-book should have, interviews were taken with experts in the field of CEIT. The results are given in Table 2 as frequency (f) and percentage (%). Unnumbered questions were answered if the answer to the previous question's answer was "YES".

Table 2.

Analysis Table of Closed Ended Interview Questions with CEIT Field Experts

Question No	QUESTIONS	YES		NO	
		f	%	f	%
1	Is there a scrollbar on the pages?	9	100		
2	Is there a search tool?			9	100
	Is there access to the search tool from each page?				
3	Is the page background color simple enough to not tire the eyes?	9	100		
4	Does the text color fade into the page background color?			9	100

5	Is the font type and size used suitable for the target group?	6	66.6	3	33.4
6	Is there a standard structure (font, size and color) for the texts?	9	100		
7	Is the transition between pages clear and comfortable?	9	100		
	Are the multimedia elements (sound, picture, graphic, table, photograph, video, animation, simulation, etc.) embedded in the text?	9	100		
		6	66.6	3	33.4
8	Are the multimedia elements appropriately positioned within the text?	4	44.5	5	55.5
	Are the explanations given about the multimedia elements sufficient?		22.3	7	77.7
	Are the multimedia items interactive?				
9	Do students have the option to listen to texts with audio?			9	100
10	Is a standard structure (font, size and color) used for links?	9	100		
11	Do the symbols (icons) used reflect the characteristics of the related content?	2	22.3	7	77.7
	Is there a "Contents" section with links to all the main and subheadings?	9	100		
12	Is it suitable to use?	1	11.2	8	88.8
	Are additional tools (dictionary, index, etc.) provided separately from the main text?	9	100		
13	Is it appropriate to give additional tools (dictionary, index, etc.) separately from the main text?	9	100		
	Are conspicuous indicators added in the e-book to help the student understand which section he or she is in?	6	66.6	3	33.4
14	Are the links/buttons working correctly?	2	22.3		77.7
15	Does the e-book open quickly?	5	55.5	4	44.5
16	Are there any directions on the use of the e-book?	2	22.3	7	77.7
17	Is it enough?	1	11.1	6	66.6
18	Do the symbols (icons) used reflect the characteristics of the related content?	2	22.3	7	77.7
19	Are external links correctly presented in the main texts?	2	22.3	7	77.7

20	Is the positioning of the "Contents" section correct?	1	11.2	8	88.8
21	Are there links between pages (forward, backward, first page, last page)?	9	100		
22	Is there a "Note-taking" tool that allows the student to take notes while reading the e-book?			9	100
23	Can the pages of the e-book print correctly?	9	100		
24	Can audio elements (if any) be turned on or off on demand?				
25	Are there page zoom in/out options? Is it enough?			9	100
26	Are the elements such as video and animation user-controlled (open-close-stop-resume)?	5	55.5	4	44.5

In addition to the closed-ended questions, the open-ended questions which are "What are the deficiencies you see in the e-book, apart from the questions asked?" and "Are there any other features that you think an interactive e-book should have? If so, what are they?", were asked. The answers of the open-ended and closed-ended questions are given below.

As a result of the meeting, instructors and postgraduate students said that when the e-book was first opened, an animation that was not related to the subject appeared instead of a cover page. They pointed out this situation may make it difficult for students to perceive the e-book as an e-book. They specified that not giving explanatory instructions on how to use the e-book may reduce the students' motivation. They indicated that some symbols' images were not related to their feature in the menus such as "Breakout", "Contents", and "TDS Dictionary". They took attention that the lack of search feature was a disadvantage in terms of using the e-book. They indicated that it was appropriate to present the content in the form of main headings and sub-headings when clicking on the "Contents" menu. But they pointed out that instead of accessing the content only when clicking on the "Contents" menu, the content should always be presented as easily accessible. They emphasized that it was useful to include scroll bars while giving content in the e-book, but the amount of text on a page should be less. They specified that since the content was created by scanning the MNE student printed book, the resolution was poor and this could tire the eyes of the students. They indicated that the factors such as presenting content by scanning, the inability to change the text size of the scanned content, some text in the content being pale, and some texts being clear, may reduce the student's performance. They indicated that the choice of background color and text color of the e-book was correct. They

also specified that the transition between the pages was easy. They said that the visual objects and links in the text were effective in terms of learning. But they pointed out that the student's concentration may be dispersed in the lesson because the visuals of these objects were animated. They indicated that the use of a tool that helps the student know which department he or she is in was a factor that increases the usefulness of the e-book. They pointed out the necessity of having a tool to take notes. They emphasized that there should be an option in the e-book where they could listen to the topics aloud. They specified that presenting learning objects separately from the content was positive in terms of usefulness. However, they emphasized that due to the fact that the learning objects were taken from the address “egitim.gov.tr”, there was no unity in terms of design. So they indicated that this situation may reduce the interest of the students in the e-book.

Determination of Interactive E-Book Features: The features that should be in an interactive e-book were determined by analyzing the results of interviews with experts in the field of social studies and CEIT, taking the positive features in the MNE sample book, analyzing the negative features, and adding new features. The features which have high-frequency values in the interview results were taken into account. The features are given in Table 3.

Table 3.

Interactive E-Book Design Principles

It should be in a printed book view	
Each page should have only one content	
The e-book cover should have	the title of the e-book
	the author information
	a publication date
The contents menu should be	in the form of presentation of the content in main and sub-headings
	easily accessible
The instructions for use should be included	
In content	font size can be changed
	fill tool can be used
	pages can be saved
	pages must be printable
	there must be searched tool

There must be audio narration and it must be user controlled

The multimedia objects must be positioned within the content

Learning object should be positioned separately from the content
must have the same design features
should be positioned in accordance with their content.

The dictionary should be a glossary of terms within the e-book.

There should be a notepad that can be recorded

An interactive e-book was developed according to the determined interactive e-book features.

Evaluation of the Developed E-Book by Social Studies Field Experts: The results of the interviews with the experts in the social studies field about the developed interactive e-book are presented in Table 4. Unnumbered questions were answered if the answer to the previous question's answer was "YES".

Table 4.

Analysis Table of Closed Ended Interview Questions with Social Studies Field Experts for Evaluation of the Developed E-Book

Question No	QUESTIONS	YES		NO	
		f	%	f	%
1	Does the interactive e-book have a cover?	9	100		
	Is a suitable cover designed for the e-ebook?	5	55.5	4	44.5
	Does the cover have a book title to reflect the content?	9	100		
	Is the author name information on the cover sufficient?	9	100		
	Does the cover have a link to the "Contents" section?	9	100		
2	Is the amount of text used on the pages sufficient?	9	100		

3	Does the content contain meaningful main and sub-headings?	9	100		
4	Are the expressions in the content understandable?	9	100		
5	Is the font type and size appropriate for the target group?	9	100		
6	Is the transition between pages clear?	8	88.8	1	11.2
	Are the multimedia elements (sound, picture, graphic, table, photograph, video, animation, simulation, etc.) embedded in the text?	9	100		
		9	100		
	Are the multimedia elements appropriate for the student level?	9	100		
		9	100		
7	Are the multimedia elements related to the content on the page they are used on?	9	100		
	Are the multimedia elements appropriately positioned within the text?				
	Are the explanations given about the multimedia elements sufficient?	9	100		
	Are the multimedia items interactive?				
8	Does the student have the option to listen to the texts with audio?	9	100		
9	Do the symbols (icons) used reflect the characteristics of the related content?	9	100		
	Are there links in the main texts to outside the e-book?			9	100
10	Are the links used appropriate?				
	Is there a "Contents" section with relevant links in all main and sub-headings?	9	100		
11	Is it easy to access?	9	100		
	Is there a "Dictionary" tool?	9	100		
12	Is its presentation appropriate?	6	66.6	3	33.4

In addition to the closed-ended questions, the open-ended questions which are "What are the deficiencies you see in the interactive e-book, apart from the questions asked?" and "Do you think there are other features that the interactive e-book should have? If so, what are they?", were asked. The answers of open-ended and closed-ended questions are given below.

As a result of the interview, instructors and teachers indicated that the

developed interactive e-book covers the basic features that should be in an interactive e-book. They specified that the expressions and the presentation of the main and sub-titles were understandable since the content was taken from the MNE social studies book. They pointed out that it was a big plus to have a "Notepad", but they indicated that the notes written in the notepad should be saved. They emphasized that in the "Dictionary" menu it was appropriate to use the dictionary of terms in the MNE social studies book. Two teachers and one instructor indicated that it would be better to present the terms in the dictionary on a few pages instead of giving them all. However, since there was a search feature in the developed interactive e-book, it has been found it appropriate to give the dictionary on a single page.

Evaluation of the Developed Interactive E-Book by CEIT Field Experts: The results of the interviews with the experts in the field of CEIT are given in Table 5. Unnumbered questions were answered if the answer to the previous question's answer was "YES".

Table 5.

For Evaluation of the Developed Application Analysis Table of Closed Ended Interview Questions with CEIT Field Experts

Question No	QUESTIONS	YES		NO	
		f	%	f	%
1	Is there a scrollbar on the pages?	9	100		
	Is there a search tool?	9	100		
2	Is there access to the search tool from each page?	9	100		
3	Is the page background color simple enough to not tire the eyes?	9	100		
4	Does the text color fade into the page background color?			9	100
5	Is the font type and size used suitable for the target group?	9	100		
6	Is there a standard structure (font, size and color) for the texts?	9	100		
7	Is the transition between pages clear and comfortable?	7	77.7	2	22.3
8		9	100		

	Are the multimedia elements (sound, picture, graphic, table, photograph, video, animation, simulation, etc.) embedded in the text?	9	100		
	Are the multimedia elements appropriately positioned within the text?	9	100		
	Are the explanations given about the multimedia elements sufficient?	7	22.3	2	77.7
	Are the multimedia items interactive?				
9	Do students have the option to listen to texts with audio?	9	100		
10	Is a standard structure (font, size and color) used for links?			9	100
11	Do the symbols (icons) used reflect the characteristics of the related content?	9	100		
	Is there a "Contents" section with links to all the main and sub-headings?	9	100		
12	Is it suitable to use?	9	100		
	Are additional tools (dictionary, index, etc.) provided separately from the main text?	9	100		
13	Is it appropriate to give additional tools (dictionary, index, etc.) separately from the main text?	9	100		
14	Are conspicuous indicators added in the e-book to help the student understand which section he or she is in ?	7	77.7	2	22.3
15	Are the links/buttons working correctly?	9	100		
16	Does your e-book open quickly?	9	100		
	Are there any directions on the use of the e-book?	9	100		
17	Is it enough?	7	77.7	2	22.3
18	Do the symbols (icons) used reflect the characteristics of the related content?	9	100		
19	Are external links correctly presented in the main texts?			9	100
20	Is the positioning of the "Contents" section correct?	9	100		
21	Are there links between pages (forward, backward, first page, last page)?	9	100		

22	Is there a "Note-taking" tool that allows the student to take notes while reading the e-book?	9	100
23	Can the pages of the e-book print correctly?	9	100
24	Can audio elements (if any) be turned on or off on demand?		
25	Are there page zoom in/out options? Is it enough?	9	100
26	Are the elements such as video and animation used user-controlled (open-close-stop-resume)?	5	55.5 4 44.5

In addition to the closed-ended questions above, the open-ended questions which are "What are the deficiencies you see in the interactive e-book, apart from the questions asked?" and "Are there any other features that you think an interactive e-book should have? If so, what are they?" were asked. The answers of the open-ended and closed-ended questions are given below.

As a result of the interview, the instructors and postgraduate students indicated that the developed interactive e-book was useful in terms of including usage instructions, having a search feature, and easy access to the contents. They emphasized that changing the font size of the texts is a positive feature for students with vision problems. However, they specified that increasing or decreasing the font size should be a limit. They indicated that the notepad was useful. However, they emphasized that users should record their notes in the notepad. The results of the interviews were analyzed and the deficiencies in the developed interactive e-book were eliminated and the interactive e-book was finalized.

2. Development of Interactive E-Book

Based on the determined interactive e-book design principles an interactive e-book as a result of the surveying of the relevant literature and the analysis of the interviews, was developed. The developed interactive e-book includes the MNE social studies book as content. Instructions for use are included in the e-book, the contents menu is easily accessible, quick filling is allowed, font size can be changed, pictures can be enlarged, maps are made to be examined in detail, and dictionary and notepad tools are included. In addition, learning objects that are compatible with each other, contain games that allow concepts to be associated, and aim to increase the understanding of the subjects were also used.

3. Comparison of the Effect of E-Books on Student Achievement

Variance Homogeneity of Experimental and Control Groups and Normality of Data: The effect of the e-books on the academic achievement of the students was examined separately as general success, knowledge level, and comprehension level. The KS test was used to determine the normal distribution. KS test results are given in Table 6.

Table 6.

KS Test Analysis Results

Test	Group	N	Achievement test	Knowledge Level Questions	Comprehension Level Questions
KS	Experiment	22	,200	,200	,131
	Control	24	,200	,052	,176
Shapiro-Wilk	Experiment	22	.52	,582	,051
	Control	24	,552	,324	,524

When Table 6 is examined, it is seen that the KS test result is greater than .05. As the Shapiro-Wilk test result values, which are used to determine the normal distribution like the KS test, are also seen to be greater than .05. So it has been considered to show a normal distribution. Levene test was used to determine the homogeneity of variances. Levene test results are given in Table 7.

Table 7.

Levene Test Analysis Results

	Achievement test	Knowledge Level	Comprehension Level
Levene	,170	,897	,095

Levene test results show the variance is homogeneous. As a result of the analysis, it was found appropriate to use the independent samples t-test as a parametric statistical analysis method.

Comparison of Achievement Test Scores of Experimental and Control Groups: Comparison of achievement test scores of the groups is given in Table 8.

Table 8.*Experiment Group and Control Group Posttest Scores*

Group	N	\bar{X}	S	sd	t	p
Experiment	22	70,13	20,21	44	1,97 *	0.55
Control	24	59.35	16,81			

* $p < .05$

When Table 8 is examined, it is seen that the arithmetic mean of the posttest scores of the experimental group was 70.13, and the control group was 59.35. According to the independent samples t-test, there is no significant difference between the post-test mean scores of the groups ($p > .05$).

Comparison of Achievement Test Knowledge Level Scores of Experimental and Control Groups: Comparison of achievement test knowledge level average scores is given in Table 9.

Table 9.*Comparison of Experiment Group and Control Group Knowledge Question Scores*

Group	N	\bar{X}	S	sd	t	p
Experiment	22	27,75	7,80	44	,53*	,59
Control	24	26.51	7,91			

* $p < .05$

When Table 9 is examined, it has been seen that the arithmetic mean of the knowledge level scores of the experimental group was 27,75, and the control group was 26,51. There was no significant difference between the knowledge level mean scores of the groups according to the independent samples t-test ($p > .05$).

Comparison of Achievement Test Comprehension Level Scores of Experimental and Control Groups: Comparison of comprehension level score averages are given in Table 10.

Table 10.

Comparison of Experimental and Control Group Comprehension Questions Scores

Group	N	\bar{X}	S	sd	t	p
Experiment	22	42.38	13,20	44	2,69	.01
Control	24	32,83	10,76			

* $p < .05$

When Table 10 is examined, it has been seen that the arithmetic mean of the comprehension level scores of the experimental group was 42.38, and the control group was 32.83. According to the independent samples t-test, it has been seen that there was a significant difference in favor of the experimental group between the comprehension level mean scores of the groups ($p < .05$).

4. Student Opinions about the E-Books

The opinions of 14 students in the experimental group have been categorized and given in Table 11.

Table 11.

Student Opinions About the Developed Interactive E-Book

S.N	Understandable	Ease of use	Increasing the desire to learn	Easy learning provider	Informative	Entertaining	Other Favorite Feature
1	x	x	x	x	x	x	Application
2	x	x	x		x	x	Application
3	x	x	x		x		Filling
4	x	x	x	x	x	x	Sound
5		x			x		Filling
6	x	x	x	x	x	x	Application
7	x	x	x		x		Search
8	x	x	x	x	x	x	Application
9	x	x			x		Search
10	x			x	x		Notepad
11					x		Notepad
12	x	x	x	x	x	x	Application
13					x		Sound
14	x	x	x		x		Notepad
Total	14	11	9	6	14	6	

According to Table 11, 11 students found it understandable, 10 students found it easy to use, 9 students found it to increase their desire to learn, six students found it to be an easy learning provider, 14 students found it informative, and six students found it entertaining. It was observed that five students liked the applications, two students liked the voice-over, three students liked the notepad, two students liked the search and two students liked the fill feature.

The views of 10 students from the control group about the MNE sample e-book have been categorized and given in Table 12.

Table 12.

Student Opinions About the Sample E-Book Published by the Ministry of National Education

S. N.	Understandable	Ease of use	Increasing the desire to learn	Easy learning provider	Informative	Entertaining	Other Favorite Feature
1					x		Dictionary
2	x	x	x		x	x	Filling
3					x		Filling
4					x		Learning object
5	x	x	x	x	x	x	Filling
6	x				x		Dictionary
7					x		Filling
8					x		Filling
9					x		Dictionary
10	x		x	x	x	x	Filling
Total	10	4	2	3	2	10	3

When Table 12 has been examined, it has been seen that four students found it understandable, two students found it easy to use, three students found it to increase their desire to learn, two students found it to be an easy learning provider, 10 students found it informative, and three students found it entertaining. One student indicated that he/she liked the learning objects, three students said that they liked the “TDS Dictionary” and six students specified that they liked the filling feature.

Discussion, Conclusion and Recommendations

MNE presented a sample e-book for a unit of the sixth-grade social studies course. But there are no strictly accepted rules in e-books design and presentation. In this research, interactive e-book design principles were determined based on the relevant literature and expert opinions. Identified interactive e-book features can be listed as; it should have print book view, there should be only one content per page, it should have a cover page, the cover page should contain the title of the book, the author information and the date of publication, the context menu should be easily accessible from every page, instructions for use should be included, font size should be changed, pages should be saved and printed, it should have a user-controlled voice narration feature, it should contain multimedia objects, learning objects with the same design features should be used, there should be a glossary of terms and a notepad. Based on these principles, an internet-based interactive e-book was developed. Afterward, the effect of the developed interactive e-book with the MNE sample e-book on the social studies course was also compared. When the effects of the developed interactive e-book and the MNE sample e-book on academic achievement were examined, it was seen that there was no significant difference between the achievement test averages of the students ($p>.05$). However, such a study was applied to the relevant groups for the first time. It is thought that this situation may have increased the interest of the students towards the lesson and the academic achievement of the students may be close to each other due to the short duration. It was observed that there was no significant difference between the students' achievement test knowledge level mean scores ($p>.05$). However, when the students' views on the e-books are examined, it is seen that they describe e-books as informative. In addition, the contents of the developed interactive e-book and the MNE sample e-book are the same. Since the same teacher conducted the teaching process in both groups, information was taken to the students by using the same methods and techniques in the lessons. Therefore, it should be considered natural that students' achievement test knowledge level averages are close to each other. When the students' achievement test comprehension level mean scores are examined, it is seen that there is a significant difference in favor of the experimental group ($p<.05$). This situation shows that the developed interactive e-book on the basis of the determined design principles has a positive effect on the students' comprehension level and thinking skills, and the effect of e-books may increase as the learning level increases. When the students' opinions about the books are examined, it is seen that all students describe the books as informative. Most of the students in the experimental group; defined the developed e-book as understandable, easy to use, and increasing the desire to learn. They indicated that the learning objects and notepad as the most liked feature. The students in the control group specified

that it was difficult to use the MEB sample book.

Based on the determined design principles, new e-books should be developed and their effects on success should be measured. New e-books should be designed for different teaching levels and age groups. In addition, the effect of e-books on high-level thinking, problem-solving, and permanence should be examined.

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