

Screen Design Principles of Computer-Aided Instructional Software for Elementary School Students

Berrin Atiker

*Department of Informatics, Istanbul University
atikerberrin@yahoo.com*

Bülent Onur Turan

*Department of Informatics, Mimar Sinan Fine Arts University
bulent.onur.turan@msgsu.edu.tr*

ABSTRACT

This study aims to present primary school students' views about current educational software interfaces, and to propose principles for educational software screens. The study was carried out with a general screening model. Sample group of the study consisted of sixth grade students in Şehit Öğretmen Hasan Akan Elementary School. In this context, the evaluation of 142 sixth grade students' about existing software are analyzed with Instructional Software Screen Design Survey. Some of the survey items were created by researchers and some of them were taken from previously created questionnaire items. The research is limited with Bilden, Eurosoft, Kraker software and the sample group is limited to sixth grade students in Şehit Öğretmen Hasan Akan Elementary School. In the scope of this study, selected examples of current instructional software are evaluated in terms of graphics, text, animation, color and screen layout. Survey data where students' ideas are collected is processed with the SPSS 15 software. There is significant difference in text, graphic and screen layout of three software. In addition, there is significant difference between Eurosoft and the other two software in terms of color and animation. In the light of the findings, revision of educational software will be useful. Qualified screen designs will be created with user reviews and the studies done in this field. Uncomplicated, simple structured graphics, and animations created with vibrant colors, and screenshots which can be adapted easily, won the admiration of students. The study based on findings aims at guiding software manufacturers and educators.

Keywords: Instructional softwares, Screen design, Elementary school education, Computer aided instruction, Computer Aided Learning.

INTRODUCTION

Developments in communication technologies form the basis of information society. Especially with the usage of computers and the Internet, it's easier to access desired information from all over the world. It's a fact that in contemporary world, most things are carried out with computers. Children before the age of primary school are beginning to use various technological tools and equipments including computers.

Computer-aided instruction meets renewed needs of individuals, and provides learning environment for people from different geographical areas at any given time and place. In addition, computer-aided instruction provides a safe learning environment for students. Therefore, visual design and contents of a software are important in this area.

From the first examples of computer aided instruction, the text is seen as dominant, and interaction is limited with clicking "next" button or pressing the space key (Jones, 1995). With the increasing usage of computers in education, graphics, audio and video have taken their place in teaching software screens. In addition, users are able not only to control the video and audio just by clicking the forward key but also to manipulate the information on screen (Jones, 1995). However, text, graphics, animation, audio and other components of teaching software which display the information are far from having a purposeful organization to obtain information easily.

There are many samples of instructional software prepared for primary school students. But most of these software's screens are not prepared effectively. Software screens are far from being committed to the principles of design and learning theory.

In this study, screen design of instructional software is analyzed. The research is limited with Bilden, Eurosoft, and Kraker software, and the sample group is limited to sixth grade students in Şehit Öğretmen Hasan Akan Elementary School. With survey data students' evaluations on this subject are investigated to redefine the screen design principles of instructional softwares.

LEARNING THEORIES AND COMPUTER AIDED INSTRUCTION

There are many theories explaining the learning process in humans. Among these, behavioral and cognitive learning theories guide the design of computer aided instruction.

According to Thorndike's law of effect in the field of learning, when the response to the stimulus encounters an award or a positive result, the relationship between stimulus and response gets stronger. According to Thorndike's other principle of law of exercise, strength of relationship between the stimulus and the response is proportional to the number of repetition.

According to Skinner, when human behavior receives positive responses, frequency of this behavior will increase (İşman, 2003). Reinforcements have an important role in the occurrence of a behaviors. Sense of accomplishment and satisfaction, and praise are examples of reinforcements, which are stimulants producing the desired results in learning environments.

Theories of behaviorism lay the theoretical foundations of computer aided instruction. The usage of reinforcements and other motivational tools in the educational software is the result of behavioral approaches. In addition, the common stages of educational software applications and exercises are a direct consequence of Thorndike's law of exercise.

Cognitive theories have emerged as a response to the behaviorism theory. These theories explain human learning and development in terms of changes in mental structures and intellectual processes involving the acquisition, organization and utilization of knowledge (Johnson, transferred from Schunk, 2014). Cognitive approaches focus on individual roles in the learning process, internal mechanisms and information processing elements (Tusting and Barton, 2006). According to cognitive theories, learning is defined as the increase in the mental capacity of a person.

According to Gestalt, which is the first approach in cognitive theory, thinking and learning activities take place in memory, and thinking activities are more important than stimulus-response relationship (İşman, 2003). Gestalt ideas are listed as follows (Yeşilyaprak, 2004):

- People perceive they saw as a whole.
- Perception of an element depends on its relationship with other elements.
- Behaviors are related to interpretation of situations faced by individuals, and they are the indication of one's learning.
- Learning is the change in individual's perception of situation he/she encounters.
- If all of the components of a subject are handled separately, the whole will not be seen.

Chang, Wilson and Dooley (2003), presented a computer application that has been redesigned with Gestalt principles and the first version of this application was given to nursing students. As a result of study's new design, 85% of users assessed the redesigned application positively.

According to Miller's Information Processing Theory, instant memory range contains restrictions on the amount of information we process and remember. Miller suggests that our capacity has some limits for processing information (Miller, 1955). Short-term memory's capacity has an average of seven units, but this capacity may vary plus or minus two units. Stack information divided into smaller pieces in instructional software is consistent with Miller's Information Processing Theory. Screens grouped as functional features reduce the duration of information search on the screen (Williams and Stimatz, 2005). In his work "Designing the User Interface", Shneiderman states that it is especially difficult for novice users to scan crowd displays (Williams and Stimatz, 2005). A lot of information in software displays cause excessive cognitive load and make a negative impact on content presentation. The amount of information displayed on the screen must be simplified or limited because more information on the screen causes an increase in the total capacity (Williams and Stimatz, 2005). Learning resources should meet the learner's needs and guide the learner effectively by recognizing the cognitive load of the items on each page (Oberfoell and Correiat, 2016).

INSTRUCTIONAL SOFTWARE AND PRINCIPLES OF SCREEN DESIGN

Instructional software is a specific educational tool, increasing the effectiveness of educational activities and which can be used in formal and informal education to teach a course. Teaching software design process is a multi-faceted research applied to various disciplines. In this regard, pedagogues, text writers, animators, filmmakers, system theorists, illustrators etc should be included in software design (Yurdakul, 2004).

The presentation of software contents is important for motivating students. Visually pleasing arrangements provide a focus on understanding the content. It will be useful to consider the following items in organising the software screen through data collected from literature survey:

- The collection of a large number of information on one screen increases the information load. With the organization of amount of information users will not be extremely loaded (Jones, 1995).
- Maps showing where users are should be provided on software screens (Jones, 1995). Thus, users will feel comfortable in learning environment.
- Lessons including animated characters, sounds and graphics motivate the students. However, when the components on the software screen such as text, animation, audio and film are not used for decorative purposes, it will contribute the users' duration of information process (Kılıç-Çakmak, 2007).
- Fields such as "sequential pipelines" should be found on the individual screens of the software (Larsen, 1995). Thus, the element of the software display is associated with the other elements of the screen at the same time (Larsen, 1995).
- Consistency in the display organization develops the learning process and facilitates the acceleration of information from one screen to another (Larsen, 1995).
- The effect of multimedia is greater than the sum of its elements. Thus, screen elements should be prepared with integrated perspective (Lee and Boling, 1996).
- Buttons, icons and menus should be emphasized to show the users a selection is made (Jones, 1995).

With instructional software screens, students should be motivated to explore the software content. Screens motivating students are important for effective explanation of lessons. However, unplanned screens have a negative effect on students' achievement and interest. In this regard, a good visual tool for communication attracts the attention of the recipient.

Referring to existing literature, an article, Using the Multi-Display Teaching System to Lower Cognitive Load was published in 2015 by Tsung-Sheng Cheng, Yu-Chun Lu and Chu-Sing Yang. In this study, an experiment was carried out with 120 college students as participants. According to the study results, multi-display instructional material significantly reduced cognitive load and enhanced learning effectiveness. An article, Understanding the Role of The Modality Principle in Multimedia Learning Environments was published in 2016 by A. Oberfoell and A. Correiat. According to this research the retention and transfer of knowledge was not as effective for low-experience content users who viewed the narrated PowerPoint presentation. In fact, users who viewed the PowerPoint presentation that only included the on-screen text, had more effective retention and transfer of knowledge. A PhD thesis, The Effect of Screen Design on Learning on the Computer Instructional Software was published in 1997 by Halil İbrahim Bülül. 32 standards related to the screen design of instructional software have been developed by this study. Also, a master thesis, The Evaluation of the Design Criteria of Web Based Computer Instruction was published in 2002 by Ahmet Arslan. In this study, web-based educational sites were examined in the light of design criteria. User Expectations Assessment Form and Website Analysis Form were used in this study.

The difference of this research from the other studies can be expressed as follows: Overall, previous studies seem to remain in theory without support by any application. The scale used in this study is different from other studies. And this study with the target group -sixth grade students- evaluating the educational software, is distinct from other studies.

METHOD

Research Design

This study was carried out with general screening model. In this model, a sample group that is taken from the universe provides a general judgement about the universe (Karasar, 2005). In the scope of this study, selected examples of current instructional software are evaluated in terms of graphics, text, animation, color, and screen layout. Then, principles for software screens are recommended in the light of learning theories and design principles.

For practical dimensions of the study, 142 people of sixth grade students evaluated the survey of Instructional Software Screen Design, and then students' opinions are analyzed about screen design of instructional software. Sample group of the study consisted of sixth grade students in Şehit Öğretmen Hasan Akan Elementary School. Sixth grade students were chosen with unmeasured sampling technique. According to this technique, all elements have an equal chance of being selected (Karasar, 2005). The sample group was residing in various districts of Asian side of Istanbul. So, the generalization of the study universe is increased.

The research is limited to Bilden, Eurosoft, and Kraker software. Also, the sample group is limited to sixth grade students in Şehit Öğretmen Hasan Akan Elementary School.

Data Collection Tools

“Instructional Software Screen Design” questionnaire, which is created in the light of literature, is used for data collection. This questionnaire is developed by the researcher in order to evaluate the instructional software screens. Three questions about students’ gender, age, and whether they have already worked with an instructional software are included in the questionnaire. Following these questions, in order to determine students’ views on instructional software screens a 5-point Likert-type scale consisting of 40 items was prepared. Four of scale items were taken from “Effects of Screen Design to Active Learning Student Survey” which was created by Halil İbrahim Bülbül; one of scale items was taken from “Selçuk University Distance Learning Programme Web Site (Student)” which was created by Birol Gülnar; three of scale items were taken from “Instructional Web Software User Expectations Assessment Form” which was created by Ahmet Arslan; four of scale items were taken from “Educational Software Evaluation Survey” which was created by Bader Güneş; two of scale items were taken from “Software Evaluation Form” which was created by Aslıhan Tüfekçi Hotomaroğlu, and twenty six of scale items were created by researcher. 5-grading is determined as completely agree (5), agree (4), undecided (3), disagree (2), strongly disagree (1). Eight of these substances are about text layout, nine of them about graphic layout, two of them about animations, three of them about colors and 18 of them about screen layout.

To determine the reliability of questionnaire items, outside the sample group of students, 139 sixth grade students completed the questionnaire in the same school. The validity of content of the questionnaire items has been examined by an expert and any necessary corrections were made afterwards. Item loads were analyzed. As a result of the application accompanied by an expert, reliability of questionnaire items, i.e. Cronbach’s alpha reliability coefficient, is calculated as α : 0.919. After pilot study, all produced survey items were used in the original scale. Spearman-Brown coefficient was found 0,860 and Guttman coefficient was 0,849.

Before the application of the survey, students used Bilden, Eurosoft and Kraker software in their school computer lab. All subjects involved in software were examined and compared by the students. After reviewing software in the laboratory, Instructional Software Screen Design survey is given to students to obtain their opinions.

Data Analysis

Survey data where students’ ideas are collected is processed with the SPSS 15 software. The data that are analyzed and processed with SPSS statistical methods in the study were interpreted to offer solutions. Questionnaire items were evaluated with single factor variance analysis for independent samples (one way ANOVA) and t-test for related samples (paired samples t-test). “Single factor variance analysis is applied to see whether or not there is a significant difference between two or more unrelated sample mean” (Büyüköztürk, 2006). “T-test is used to see whether or not there is a significant difference between two associated samples” (Büyüköztürk, 2006).

FINDINGS

Findings about Personal Information

As shown in Table 1, 66 female (46,5%) and 76 male (53,5 %) students participated the study.

Table 1. Gender

Gender	Number of Students	Percent (%)
Female	66	46,5
Male	76	53,5
Total	142	100,0

As shown in Table 2, 76 of students (53,5%) are 11 years old and 66 of these students are 12 years old (46,5%).

Table 2. Age

Age	Number of Students	Percent (%)
11	76	53,5
12	66	46,5
Total	142	100,0

As shown in Table 3, students (6,3 %) previously used an instructional software, while 133 students (93,7 %) students have never used an instructional software before.

Table 3. Experience

Experience	Number of Students	Percent (%)
Having Instructional Software Experience	9	6,3
Not Having Instructional Software Experience	133	93,7
Total	142	100,0

Findings and Interpretations Related to Instructional Software Comparison

Table 4 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the text layout. Furthermore, according to the results of Scheffe, test there is significant difference between Bilden-Eurosoft, Bilden-Kraker and Eurosoft-Kraker software in the text layout.

Table 4. Text Layout

	N	Average	Standard Deviation
Bilden	142	31,51	4,38
Eurosoft	142	30,04	4,91
Kraker	142	32,88	4,14
Total	426	31,48	4,62

Table 5 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the graphic layout. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft, Bilden-Kraker and Eurosoft-Kraker software in the graphic layout.

Table 5. Graphic Layout

	N	Average	Standard Deviation
Bilden	142	36,51	5,78
Eurosoft	142	33,16	5,82
Kraker	142	37,53	4,68
Total	426	35,73	5,75

Table 6 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the animations. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft and Eurosoft-Kraker software in the animations.

Table 6. Animations

	N	Average	Standard Deviation
Bilden	142	7,98	2,04
Eurosoft	142	6,85	1,90
Kraker	142	8,11	1,81
Total	426	7,64	1,99

Table 7 shows that Bilden software has the highest scores and Eurosoft software has the lowest points in the colors. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft and Eurosoft-Kraker software in the colors.

Table 7. Colors

	N	Average	Standard Deviation
Bilden	142	12,44	2,47
Eurosoft	142	10,91	2,79
Kraker	142	12,29	2,51
Total	426	11,88	2,68

Table 8 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the screen layout. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft, Bilden-Kraker and Eurosoft-Kraker software in the screen layout.

Table 8. Screen Layout

	N	Average	Standard Deviation
Bilden	142	72,20	11,35
Eurosoft	142	68,01	10,64
Kraker	142	74,60	10,09
Total	426	71,60	11,02

Table 9 shows that Kraker software has the highest scores and Eurosoft software has the lowest points in the total. According to the results of Scheffe test, there is significant difference between Bilden-Eurosoft, Bilden-Kraker and Eurosoft-Kraker software in the total.

Table 9. General Total

	N	Average	Standard Deviation
Bilden	142	160,63	21,78
Eurosoft	142	148,97	21,26
Kraker	142	165,41	18,71
Total	426	158,34	21,71

Findings and Interpretations Related to Experience Variable

Students who have experience in using software gave lower scores than students who have no experience in graphical layout of Kraker software. Also students who have experience in using software gave lower scores than students who have no experience in the general total of Kraker software.

Findings and Interpretations Related to Age Variable

With respect to the age variable, there is no significant difference between three software. The reason for this can be the proximity of age levels.

Findings and Interpretations Related to Gender Variable

With respect to the gender variable, there is no significant difference between male and female students' software reviews.

CONCLUSION AND RECOMMENDATIONS

There is significant difference in text layout of three software. Font size is small for target audience in Eurosoft software. It is also more text-based. Long text descriptions are placed next to each image in Bilden software. Students will not get bored with texts in Kraker software which has highest scores and has larger font size than other software. Kraker is the most desirable software which has less text density. The comparison of three software's text layout is shown in Table 10. In addition, screenshots of Eurosoft, Bilden and Kraker software are shown in Figure 1, Figure 2 and Figure 3.

Table 10. Comparison of Eurosoft, Bilden and Kraker Software's Text Layout

Eurosoft	Bilden	Kraker
<ul style="list-style-type: none"> • Font size is small for target group • Text-oriented software 	<ul style="list-style-type: none"> • Long text descriptions are placed next to visuals 	<ul style="list-style-type: none"> • Larger font is used • Stimulating short text are included



Figure 1. Eurosoft software screenshot



Figure 2. Bilden software screenshot

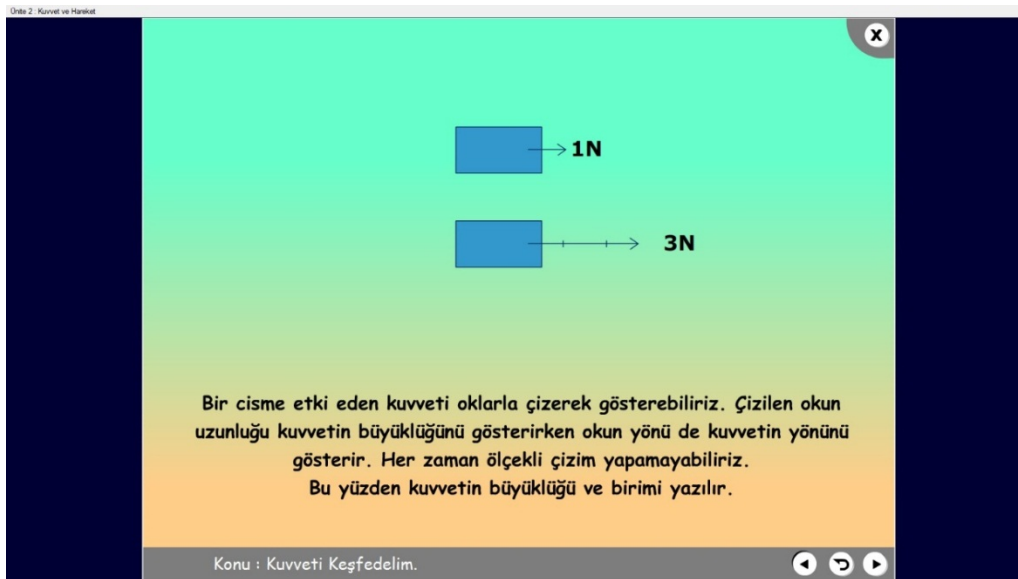


Figure 3. Kraker software screenshot

There is significant difference in graphic layout of three software. Simplicity and uncomplicated structure of graphics can be interpreted as an asset of Kraker software. The number of graphics in Eurosoft is lower than the other software. Graphics are not capable of supporting the students to focus on the lessons and they are far from attracting the attention of students. A variety of images are included in Bilden software. These images are located next to the texts. The comparison of three software's graphic layout is shown in Table 11.

Eurosoft	Bilden	Kraker
<ul style="list-style-type: none"> • Few graphics are included. • Graphics are not capable of supporting the students to focus on the lessons and they have insufficient visuality to attract the attention of students 	<ul style="list-style-type: none"> • Each subject includes various images 	<ul style="list-style-type: none"> • Simple and uncomplicated graphics are included

There is significant difference between Eurosoft and the other two software in terms of animation. Animations in Eurosoft software are far from attracting the attention of students. Users control the animation display in Bilden software. Students appreciate the animations in Kraker software. The comparison of Eurosoft and the other two software's animations is shown in Table 12.

Eurosoft	Bilden – Kraker
<ul style="list-style-type: none"> • Insufficient features that will attract the attention of students 	<ul style="list-style-type: none"> • Animations of Kraker and Bilden Software are appreciated by the students

There is significant difference between Eurosoft and the other two software in terms of color. Blue hue is dominant in Eurosoft software. The number of colors used in graphics is limited in Eurosoft software. Mainly yellow, orange and red colors are used. With the usage of many colors, the other two software are very much appreciated. More vivid colors have won the highest scores by the students. The comparison of Eurosoft and the other two software's colors is shown in Table 13.

Table 13. Comparison of Eurosoft and Bilden-Kraker Software’s Colors

Eurosoft	Bilden – Kraker
<ul style="list-style-type: none"> • Blue hue is dominant • The number of colors used in graphics is limited • The graphics are mainly yellow, orange and red 	<ul style="list-style-type: none"> • With the usage of many colors, these software are appreciated by the students

There is significant difference in screen layout of three software. Kraker software can easily be used by the students. With simple screen design Kraker software’s average is higher than the other two software. A large number of buttons are placed in Bilden software screen. In this sense, Bilden software is more detailed than Kraker software. Although easy to use, Eurosoft software does not encourage to discover itself. The comparison of three software’s screen layout is involved in Table 14.

Table 14. Comparison of Eurosoft, Bilden and Kraker Software’s Screen Layout

Eurosoft	Bilden	Kraker
<ul style="list-style-type: none"> • Although easy to use, software does not encourage to discover itself. 	<ul style="list-style-type: none"> • Detailed screen design 	<ul style="list-style-type: none"> • The software screen can easily be used by the students • The software has simple screen design

The Eurosoft software screenshot gives an impression of the course book organized in electronic environment. The screens in the software are static and monotone. Just the same screens that change in content cause the target group to get bored soon.

The presence of many applications dictionary, search, etc. can be considered as an important feature in terms of software density in Bilden software. But the button to which these applications take place is not recognized by some users. These situation results in the students never reaching these parts. It is important for students to be able to easily access the functions on the screen and to have these functions visible. Figure 4 shows the first position of the button and Figure 5 shows the button after clicking.



Figure 5. Bilden software screenshot – button first position



Figure 6. Bilden software screenshot – button after clicking

The graphics and animations in the Kraker software are simple and cute drawings. In this sense, the interest of the students keep alive. In Kraker software, images are weighted and software has less text than other software. In the software, different background colors and activities used on each screen enable the students to discover the software. Every activity on the software screen that is not similar to the previous screen keeps the interest of the students to the program.

Titles in the Kraker software are located at the bottom of the screen. Placing the topic title at the top of the screen will allow the student to pay attention to which topic is studying. Figure 7 shows that the topic title is positioned at the bottom of the screen.

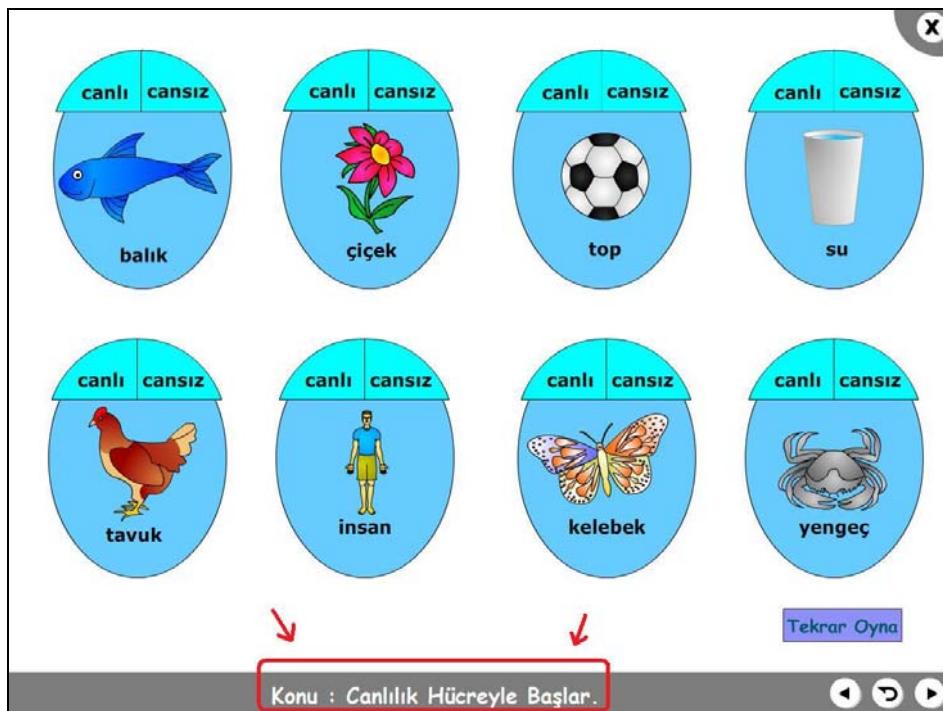


Figure 7. Kraker software screenshot – title positioned at the bottom of the screen

Overall Kraker is the most popular, and Eurosoft is the least popular software. In the light of the findings, revision of educational software will be useful. Qualified screen designs will be created with user reviews and the studies made in this field. Approval of relevant experts should be obtained in

the process of educational software screen design and after being tested on subjects, screen designs proved to be productive and efficient can be used (Bülbül, 1997). Also, principles and methods of teaching should be taken into account in all phases of the educational software design (Arslan, 2002). The analysis of the target audience will enable the software screens to be well suited to users' needs. In this sense, design of simple line graphics and animations attracting students are important. Shorter animations, which can be controlled by the student, will be more beneficial. Important points about the subject especially should be intensified in animated areas because animated elements attract students' attention. The usage of colorful graphics to portray the static situations and different images that appeal to students in each case will encourage them to explore the software. Texts should emphasize important points in instructional software. Because of the screens with too much explanation users cannot decide which information is trivial. This situation will result in the overwhelming of user's memory with excessive cognitive load. In addition, user screens should be prepared in a simple way for adaptation of the students as soon as possible.

This study used a small sample of 142 participants and quantitative research often suggests the larger the sample, the richer the interpretation. The survey was evaluated only one school students. Another possible limitation of this study is the number of software: it is limited with Bilden, Eurosoft, and Kraker software.

This research seems scholarly important because of its contribution to effective design of instructional screens. It contributes to next studies by proposed criteria that instructional software screens must carry and by suggestions about current instructional software screens that are evaluated by students using software. This research is significant for being a guide to software developers with design principles and learning theories.

REFERENCES

- Arslan, A., (2002). Web destekli bilgisayar öğretiminin tasarım kriterlerinin değerlendirilmesi [The Evaluation of the design criteria of web based computer instruction] (Master's Thesis), Marmara University, Istanbul.
- Bülbül, H. İ., (1997). Bilgisayar öğretim yazılımlarında ekran tasarımının öğrenmeye etkisi [The Effect of screen design on learning on the computer instructional software] (Doctoral dissertation), Ankara University, Ankara.
- Büyüköztürk, Ş., (2006). Sosyal bilimler için veri analizi el kitabı [The Data base hand book for social science], Ankara: Pegem A Yayıncılık.
- Cheng, T., Lu, Y. and Yang, C., (2015). Using the multi-display teaching system to lower cognitive load, *Educational Technology & Society*, 18(4), 128-140.
- Oberfoell, A. and Correiat, A., (2016). Understanding the role of the modality principle in multimedia learning environments, *Journal of Computer Assisted Learning*, 32, 607-617
- Chang, D., Wilson C. and Dooley, L., (2003). Towards criteria for visual layout of instructional multimedia interfaces, *J. Educational Technology Systems*, 32(1) 3-29.
- İşman, A., (2003). Öğretim teknolojileri ve materyal geliştirme [Educational technologies and material developing], Istanbul: Değişim Yayınları.
- Johnson, G.M., (2014). The Ecology of interactive learning environments: Situating traditional theory, *Interactive Learning Environments*, 22(3), 298-308.
- Jones, M. G., (1995). Visuals for information access: A new philosophy for screen and Interface Design. In D. G. Beauchamps, R. A. Braden & R. E. Griffin (Eds), *Imagery and visual literacy* (pp. 264-272). Blacksburg, VA: International Visual Literacy Association.
- Karasar, N., (2005). Bilimsel araştırma yöntemi [Scientific research method], Ankara: Nobel Yayıncılık.
- Kılıç-Çakmak, E., (2007). Arayüz tasarımında yeni bir yaklaşım: Paralel öğretim tasarımı [A new approach in interface design: Parallel instruction design], *Gazi University Journal of Gazi Educational Faculty*, 27(1), 1-22.
- Larsen S., (1995). What is "quality" in the use of technology for children with learning disabilities?, *Learning Disability Quarterly*, 18(2), 118-130.
- Lee, S. H. and Boling, E., (1996). Motivational screen design guidelines for effective computer-mediated instruction, *Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology*. Indianapolis, IN, 401-12. ERIC Document ED 397 811.
- Miller, G. (1955). The magical number seven, plus or minus two some limits on our capacity for processing information, *Psychological Review*, 101(2), 343-352.
- Tusting, K., Barton, D., (2006). Models of adult learning: A literature review. Leicester: NIACE.
- Williams, B. O. and Stimatz, L. R., (2005). The Origins of graphic screen design principles: Theory or rhetoric?, *International Journal of Instructional Media*, 32(2), 181-193.
- Yeşilyaprak B., (2004). Gelişim ve öğrenme psikolojisi [Development and educational psychology]. Ankara: Pegem A Yayıncılık.

Yurdakul, İ., (2004). Eğitim ortamında etkileşimli çokluortam CD-ROM'larının değerlendirilmesi [The Evaluation of interactive multimedia CD-ROMs in educational media], *The Turkish Online Journal of Educational Technology*, 3(4), 98-101.

APPENDIX

Instructional Software Screen Design Survey

Personal Information

- 1) Name Surname:
- 2) Gender: Female Male
- 3) Age: 10 11 12 13
- 4) Have you ever studied with an instructional software before? Yes No
If yes, specify the names of these software:

The following evaluation sentences for instructional software screens are scaled from negative to positive 1 to 5. Please mark the most appropriate number for you when scaling these evaluation sentences.

Scale:

- 1: Strongly Disagree
- 2: Disagree
- 3: Undecided
- 4: Agree
- 5: Strongly Agree

TEXT LAYOUT

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1. The letters on the screen are easy to read.	1	2	3	4	5
2. The spacing between the lines of text makes it difficult to read the text.	1	2	3	4	5
3. There are overloaded paragraphs on the screen.	1	2	3	4	5
4. The information in the subject is organized regularly.	1	2	3	4	5
5. Page titles cover the topics.	1	2	3	4	5
6. Significant parts of the topics are highlighted with italic letters, with different colours, with sparkle effect or with flashing effect.	1	2	3	4	5
7. Texts are created in length that does not exceed the user attention limit.	1	2	3	4	5
8. For each paragraph, the title that summarizes the paragraph content is used.	1	2	3	4	5

GRAPHIC LAYOUT

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
9. Graphics of the software facilitates the learning process.	1	2	3	4	5
10. The graphics used are suitable for learning level.	1	2	3	4	5
11. The graphics are complex and detailed.	1	2	3	4	5
12. The important parts of the subject are emphasized in the pictures used.	1	2	3	4	5
13. Graphics are not related to the content of the course.	1	2	3	4	5
14. The graphics have a visual structure that increases the motivation of the course.	1	2	3	4	5

15. Graphics are effective and appropriate for their purpose.	1	2	3	4	5
16. The picture related to a given text is displayed on the same screen with the picture.	1	2	3	4	5
17. The pictures and graphics used are simple enough to summarize the content.	1	2	3	4	5

ANIMATIONS

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
18. Animations are short enough to prevent users from getting bored.	1	2	3	4	5
19. Animations increase my interest in subject.	1	2	3	4	5

COLORS

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
20. Colour harmony is present on the screens.	1	2	3	4	5
21. The background colour and the colours of the elements on the screen do not make eye strain.	1	2	3	4	5
22. The colours used on the screen are effective and appropriate for their purposes.	1	2	3	4	5

SCREEN LAYOUT

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
23. The elements on the screen are balanced.	1	2	3	4	5
24. I can easily access the functions I'm looking for on the screen.	1	2	3	4	5
25. I can easily access home, help, exit, etc. menus.	1	2	3	4	5
26. The software is easy to use in general.	1	2	3	4	5
27. The software encourages you to discover the program by offering more than you can see at first glance.	1	2	3	4	5
28. I easily learned the use of the screens in a short time.	1	2	3	4	5
29. The number of steps that must be followed to complete a process is too many.	1	2	3	4	5
30. Important information on the screen can easily be distinguished.	1	2	3	4	5
31. Gaps are effectively used on the screen.	1	2	3	4	5
32. Menus are handy and easy to understand.	1	2	3	4	5
33. In the software, pages can be moved forward or backward and the desired page can be reached at any time.	1	2	3	4	5
34. Important points are emphasized in the software content.	1	2	3	4	5

35. The program screen is dense and complicated.	1	2	3	4	5
36. The program screen prompts learning during the course.	1	2	3	4	5
37. Screen design is intensifying and aesthetic.	1	2	3	4	5
38. There is harmony and consistency between the different screens.	1	2	3	4	5
39. The priority of the elements are well established on the screens.	1	2	3	4	5
40. The movement of the elements on the screen is suitable for natural eye movement.	1	2	3	4	5