Journal of Theoretical and Applied Information Technology

www.jatit.org

EVALUATION OF VIRTUAL CLASS APPLICATIONS IN TERMS OF PRINCIPLES OF MULTIMEDIA DESIGNING AND USE OF VISUALS*

[1]Abdullah Kuzu, [2]Ömer Uysal, [3]Kerem Kılıçer

[1]Assist Prof., Faculty of Education, Anadolu University, Eskişehir, Turkey-26470

[2]Lecturer, Faculty of Education, Anadolu University, Eskişehir, Turkey-26470

[3]Resc. Asst. Graduate School of Educational Sciences, Anadolu University, Eskişehir, Turkey-26470

E-mail: akuzu@anadolu.edu.tr, ouysal@anadolu.edu.tr, kkilicer@anadolu.edu.tr

ABSTRACT

Today, the increase in the demand for higher education has made it necessary for individuals to take professional development trainings and life-long learning into consideration following their university education due to the requirements of business life. In addition, institutions require their personnel to develop their knowledge and skills constantly. As a result, there has been an increase in virtual education applications in the world. Especially higher education institutions open online courses in virtual classes and execute virtual education applications in accordance with the needs of public and private institutions. However, for the virtual class applications executed to provide an effective online educational environment, it is necessary to determine the efficiency of these applications in terms of principles of multimedia designing. In this respect, this study evaluates the 42 visuals and 72 multimedia screens – used in virtual class applications executed in four universities leading online learning - in terms of principles of multimedia designing and use of visuals.

As a result of the study, it was revealed that not enough visuals were used in instructional multimedia messages used in virtual class applications executed for educational purposes at universities, that there was unnecessary use of the scroll-bar, and that the visuals and the related explanations were not efficiently made free of cognitive load. In line with the research findings, it is seen that universities experienced enough in virtual class applications are not able to use multimedia components functionally.

Keywords: *Virtual Class, Multimedia Designing, Use of Visuals*

1. INTRODUCTION

Today, there is growing interest in learning. Learning to learn and life-long learning have become the basic vision of education. Educational programs are developed and evaluated in line with this vision. With the rapid developments in information and communication technologies, the transfer of thoughts, opinions and knowledge is carried out in different ways. In the course of time, Computer and Internet technologies have been turned into ICT technologies meaning information and communication technologies. Thanks to computer technologies, texts, drawings, graphics, animations and demonstrations can be created, stored and manipulated in a digital environment. With the help of Internet technologies, information can be sent to the far end of the world in seconds. Initially, depending on the changes in technology, text-based educational environments undergo change towards interactive texts, interactive environments, multimedia and then towards the virtual reality. In this respect, online education has gained power as an alternative to face-to-face education. According to statistics in 2007, out of 18 million high school students in America, 4 million of them took at least one of their courses online [2].

In mid-1980s, thanks to the developments in operating systems, the old and new media were integrated by aggregating the publishing and computers. All these media developed with each other's support. With the spread of these media, the world of information and communication has changed. The new and numerous connections established between telephones, computers, videos and the screens have brought about a number of new environments of communication. The multimedia appeared due to the new environments

created in computers, phones and videos with the integration of texts, data, sounds and images.

There are a number of different definitions regarding the concept of multimedia. According to some of these definitions, multimedia refers to the use of different media forms together for presentation [19]. With respect to another definition, multimedia means information turned into an image, video or an animated picture. Different from a plain text, a multimedia document should include at least one of these elements [10]. In other words, multimedia means the use of at least one of such elements - besides a text – as audios, picture, three-dimensional graphs, animation, and high-resolution graphs [14]. Multimedia was defined as interactive computer presentations that include at least two of such information sources as texts, audios, pictures, animated pictures, and graphs [1]. In this respect, the integration of plain texts, graphs, animations, pictures, videos and audios in a computer system for the presentation of a specific content constitutes multimedia [11]. According to Mayer, multimedia is the use of words and pictures in a presentation material. When information is presented together with verbal symbols and pictures, there occurs more effective learning than when it is presented only with verbal symbols [15]. Another researcher claims that better learning in multimedia depends more on the cognitive activities of individuals than on their physical activities. The words stated in the definition by Mayer refer to all verbal symbols. For example, an activity of story-telling or any conversation, the sound effect or writing on the computer screen, the written texts in a book and so on are all verbal symbols. As for the pictures stated in the definition, they refer to illustrations, graphs, maps, animated pictures, animations, and videos and all other visual elements. The definition provided by Mayer is comprehensive enough to cover all multimedia applications and denotes the technology that presents the materials both visually and verbally.

Mayer also mentions important principles for designing effective multimedia learning. These principles are briefly explained in Table 1 below.

Table 1. Principles of Multimedia Designing

Principles of Multimedia Designing	Explanation
Multimedia Principle	Learners learn better in learning environments that include pictures and words together than in other learning environments that include only words.
Spatial Contiguity Principle	Learners learn better when related words and pictures are put close to one another on a page or on a screen than when put far from each other.
Temporal Contiguity Principle	Learners learn better in environments that provide related words and pictures simultaneously than in environments in which related words and pictures are presented one after another.
Coherence Principle	Learners learn better if the words, pictures or sounds irrelevant to the subject are not included in the environment.
Modality Principle	Learners learn better from animations and narrations than from oral and written presentations.
Redundancy Principle	Learners learn better in environments in which animations and narrations are provided together than in cases in which animations, narrations and written words are presented together.

Visuals in multimedia have special importance since they explain processes, facts and events - expressed with thousands of words – better than sounds and texts can do [17]. In this respect, Mayer classifies visuals as representational, decorative, explanative and organizational. Representational pictures are pictures used to depict a single element and to show what the element expressed in the text resembles to. Organizational pictures are pictures or schemes that demonstrate the relationships between the pictures and the elements. Decorative pictures are used to motivate readers by drawing their attention to the subject. As for explanative pictures, they show how a system works. In addition, Mayer stated that there are important features of visuals to consider while using them for effective visual designing. These features can be seen in Table 2 below.

Tablo 2. Principles of Multimedia Designing

Principles of Multimedia Designing	Explanation
Concentrated	The main idea in the text and visuals are highlighted through certain methods like drawings, colors, arrows and so on.
Concise	Unnecessary definitions in texts and dispensable features in visuals are avoided
Correspondent	The picture and the text related with the picture are put close to each other on the page
Concrete	The picture successfully visualizes the picture related to itself
Coherent	The logical structure expressed in a text is reflected in the related picture. The picture and the text are consistent.
Comprehensible	The subject of the text is supported by a picture appropriate to the previous learning of the student
Codable	The key concepts and features in the text are presented in a way to remember easily from the picture.

In literature, the results of studies on multimedia designing support the principles stated by Mayer [15]. According to these results, the multimedia that addresses more than one sense considerably influences memorability [16], [18], [20]. The results also show that the more senses are involved in the learning process for especially three-dimensional multimedia designs, the better real-life-like learning will be achieved [4]. Moreover, with the help of multimedia, it was revealed that self-learning individuals reach more profound information than those who learn from others do [4]. It is also reported that besides the effective use of such elements as texts, pictures, and audios in multimedia designs, instructional design is also fairly important and that the conceptual requirements, students, environment, integration and the products used should be taken into consideration in the process of designing [8], [9]. According to the results of studies in literature, multimedia facilitates learning, yet for effectiveness, certain variables should be taken into consideration.

In this respect, virtual class applications whose number is increasing day by day in higher education will be evaluated in terms of Mayer's principles of multimedia designing and use of visuals, and the determination of the current situation constitutes the basis of this study [15].

2. METHOD

In this study that aims at evaluating the virtual class applications in terms of principles of multimedia designing and use of visuals, "Single-Scanning Model" was used. Survey methods help describe a current situation or a situation in the past as it is. [12]. For this reason, in this study, the current situation of the virtual class applications at universities are described as it is. For the analysis of the data, SPSS 15.0 and Excel 2007 were run, and 0.05 was taken as the significance level in the study.

2.1. The Purpose of the Study

The present study aims at determining the overall situation by evaluating the visuals and multimedia screens used in virtual class applications executed by universities for educational purposes in terms of principles of multimedia designing and use of visuals. In this line, this study seeks answers to the following questions;

1. What is the overall situation of the multimedia screens used in virtual class applications for educational purposes in terms of principles of multimedia designing?
2. What is the overall situation of the visuals used in virtual class applications for educational purposes in terms of principles of use of visuals?

2.2. Limitations

This study is limited to;

- The virtual applications executed for educational purposes at Wisconsin Technical College, Open University, Ahmet Yesevi University and Sakarya University in the Fall of 2006-2007 academic year, and to

- Mayer's principles of multimedia designing and use of visuals.

2.3. Sample of the Study

Purposeful sampling was used to choose the virtual class applications to be evaluated in the scope of the study. The sample with specific and restrictive features is the focus of purposeful sampling [7]. In this respect, such factors as accessibility for everyone, experience in online education, facility of visually-interactive choice of courses, and easy use of visual elements were taken into consideration while choosing the universities. Therefore, one lesson unit from the virtual class applications in the course of "Multimedia Applications" executed at Sakarya University and one from the virtual class applications in the course of "General Chemistry" at Ahmet Yesevi University in the Fall of 2006-2007 academic year were chosen. In addition, one lesson unit from the virtual class applications in the course of "Computers: Bits & Bytes" executed at Open University and one from the virtual class applications in the course of "Electronics" at Wisconsin Technical University were chosen. The universe of the study included a total of 42 pictures and 72 screens in the virtual class applications from the four courses chosen.

2.4. Data Collection Tool

For the evaluation of the visuals in the virtual class applications executed for educational purposes at universities, the "Evaluation Scale for Visual Elements" developed by Kuzu, Akbulut and Şahin – the reliability coefficient of which was found as (α=0.87) was used [13]. According to the Evaluation Scale for Visual Elements, visual elements are classified in four categories as representational, organizational, decorative and explanative. Moreover, the scale includes 7 general design principles which are concise, concentrated, correspondent, concrete, coherent, comprehensible and codable, and which will be used to analyze texts and visual elements. Using The Evaluation Scale for Visual Elements, the participants grade the visuals with the help of such options in the scale as *pictures do not meet the related criteria*, *pictures meet the related criteria yet with inadequacies*, and *pictures meet the related criteria*.

The evaluation tool to be used for the evaluation of virtual class applications in terms of the principles of multimedia designing was developed by the researchers of the present study based on the principles stated by Mayer [15]. The evaluation tool developed included 6 criteria to be used for the evaluation of visuals, sounds, and texts in terms of screen design. These criteria were multimedia, spatial contiguity, temporal contiguity, coherence, modality, and redundancy, and there were scoring options for these criteria (do not meet the related criteria =1, meet the related criteria yet with inadequacies =2, meet the related criteria =3). In order to finalize the evaluation tool, experts were consulted for their views. One of these experts was an expert in the field of assessment and evaluation, and two were instructional technologists. The evaluation form was sent to the three experts for their views, and it was revised by doing the necessary changes based on the expert views.

2.5. Data Collection Process

A total of four virtual educational applications, two domestic and two from abroad, were separately evaluated - in terms of visuals and principles of multimedia designing - by 5 specialists who were experienced in multimedia learning as faculty members in the Department of Computer and Instructional Technologies at Anadolu University. The evaluation process was carried out in the computer laboratory of the Department of Computer and Instructional Technologies at Anadolu University. First, the participants were informed about the study. Then, a presentation was made regarding how the evaluation will be carried out. Following the presentation, the questions of the participants were answered. Afterwards, the pictures and screens in the virtual class applications were shown one by one, and the visuals and screens were scored individually.

3. FINDINGS AND DISCUSSION

In the scope of the study, three different sets of data were obtained. First, the type of the visuals used in virtual class applications for educational purposes was determined. The visuals were classified by experts with the help of the "Evaluation Scale for Visual Elements" as "1=*Decorative*, 2=*Representational*, 3=*Organizational*, 4=*Explanative*". In order to calculate the consistency between the scores assigned by the scorers to the 42 visuals evaluated, the correlation coefficient of Cronbach α was calculated. The α value higher than 0.70 suggested that there was a high level of relationship between the scorers [7]. As a result of the analysis, the correlation coefficient of the picture types was found to be α=0.88 for the scorers. Depending on this result, since the α value was higher than 0.70, it could be stated that the scores that will help

determine the types of the visuals were consistent with each other.

Secondly, the scorers, using the "Evaluation Scale for Visual Elements", scored the 42 visuals in terms of *Concentrated*, *Concise*, *Correspondent*, *Concrete*, *Coherent*, *Comprehensible* and *Codable*. The scores assigned for each visual by the scorers were typed into an Excel table. The total scores for each visual were calculated in Excel. The results obtained were entered into SPSS. In order to calculate the consistency between the scores assigned by the scorers, the correlation coefficient of Cronbach α was calculated. The value of α higher than 0.70 suggested that there was a high level of relationship between the scorers [7]. As a result of the analysis, the correlation coefficient of the visuals was found to be α=0.83 for the scorers. Depending on this result, since the α value was higher than 0.70, it could be stated that the scores assigned to the visuals by the scorers were consistent with each other. This means the scores assigned by the scorers were similar or close to each other.

Third, the scorers, with the help of the evaluation tool developed by the researchers, scored 72 screens in the virtual class applications in terms of the principles of *Multimedia*, *Spatial Contiguity*, *Temporal Contiguity*, *Coherence*, *Modality* and *Redundancy*. The scores assigned for each screen by the scorers were typed into an Excel table. The total scores for each visual were calculated in Excel. The results obtained were entered into SPSS. In order to calculate the consistency between the scores assigned by the scorers, the correlation coefficient of Cronbach α was calculated. The value of α higher than 0.70 suggested that there was a high level of relationship between the scorers [7]. As a result of the analysis, the correlation coefficient of the screens was found to be α=0.95 for the scorers. Depending on this result, since the α value was higher than 0.70, it could be stated that the scores assigned to the screens by the scorers were consistent with each other. This means the scores assigned by the scorers were similar or close to each other. When all these results are examined, it is seen that the scorers carried out similar and consistent evaluations.

3.1. Findings Regarding the General Situation at Universities

Regarding the evaluation of the visuals and multimedia screens used in virtual class applications for educational purposes in terms of principles of multimedia designing and use of visuals, the results obtained from the evaluation tool that includes triple likert-type items were analyzed considering the evaluation intervals. The evaluation intervals were determined using the formula (n–1/n) - n=3 for the triple likert-type. The analyses were carried out individually for the visuals and screens. For the interpretation of the arithmetic means obtained, the evaluation intervals seen in Table 3 were used.

Table 3. Evaluation Intervals for the Visuals and Screens

Evaluation Intervals	Visuals $\overline{X}$	Multimedia Screens $\overline{X}$
Low	1.00 – 1.66	1.00 – 1.66
Medium	1.67 – 2.33	1.67 – 2.33
High	2.34 – 3.00	2.34 – 3.00

In addition, in order to measure the consistency of the scores assigned by the scorers for the visuals and the screens, the correlation coefficient of Cronbach (α) was calculated. The reason was that in combined measurements, the coefficient α provides the correlation between the observed scores and the real scores regarding the combined measurement. Here, the coefficient α reveals the consistency of the scores of the components with the combined test scores [3]. As can be understood, the coefficient α is an indicator of the consistency of all the items in a scale regarding what is intended to be measured by the scale. The closer the coefficient α is to 1, the higher the consistency of the items in that scale is. Generally, in social sciences, the characteristics of individuals are measured through test or scale items. In this study, the features of the visuals and screens chosen according to specific criteria were evaluated based on the scores obtained as a result of the observations of five experts in terms of different variables. Therefore, the measurements obtained from each scorer were considered like scores obtained from an item of a scale, and the coefficient α was used for the measurement of the consistency between the scorers.

Table 4 shows the general situation regarding the virtual class applications in terms of use of visuals and multimedia screen design.

Table 4. The Mean Scores of Universities in Terms of Visuals and Screens

University	Visual			Multimedia Screen		
	N	$\overline{X}$	Total Score	N	$\overline{X}$	Total Score
A- Sakarya University	3	2.45	85.67	8	1.46	43.63
B- Ahmet Yesevi University	19	1.91	66.74	30	2.06	61.83
C- Wisconsin Technical University	11	2.30	80.64	13	1.98	59.23
D- Open University	9	1.91	66.78	21	1.22	36.67
TOTAL	42	2.14	71.74	72	1.68	52.00

When the visual elements were examined in terms of their use, the most successful university with respect to the visual elements used was Sakarya University, then came Wisconsin Technical University, Open University, and Ahmet Yesevi University, respectively. This situation revealed that Sakarya University and Wisconsin Technical University were successful at a high level in terms of the effective use of visual elements and that the other two universities were successful at a medium level. The virtual class application at Wisconsin Technical University was successful in terms of the correspondent and coherent elements and unsuccessful in terms of codable element. As for the other elements, the virtual class application at this university was considered to have problems that could be solved. The virtual class application at Open University was found to have problems - that could be solved - in terms of the elements of correspondent and concrete and was considered unsuccessful with respect to the other elements.

When the multimedia screens were examined in terms of effectiveness, the most successful university, as seen in Table 4, was Ahmet Yesevi University, then came Wisconsin Technical University, Sakarya University and Open University. This situation revealed that in terms of effective designing of multimedia instructional messages, Ahmet Yesevi University had a high level of success, Wisconsin Technical University had a medium level of success, and the other two universities had a low level of success. It was also found out that the virtual class application at Ahmet Yesevi University had problems – that could be solved – in terms of the principle of modality, was unsuccessful in terms of redundancy, and was successful with respect to the other principles. The virtual class application at Wisconsin Technical University was found unsuccessful in terms of modality and redundancy and successful with respect to the other principles. It was also revealed that Sakarya University had problems – that could be solved – in terms of the principles of coherence and multimedia and was unsuccessful with respect to the other elements. In other words, at this university, mostly texts were used in the virtual class application and not much correspondence was achieved between the visuals used and the related explanations. As for the virtual class application at Open University, it was found unsuccessful with respect to all the principles.

Furthermore, one-way analysis of variance was applied to see if the total scores obtained from the scorers regarding the virtual class applications significantly differed with respect to the university. The results obtained are seen in Table 5 and Table 6.

Table 5. The Results of Variance Analysis Regarding the Universities and Multimedia Screens

Variance Source	Sum of Squares	df	Mean Square	F	P	Significant Difference
Between Groups	9078.98	3	3026.33	24.935	.000*	B-A, B-D, C-A, C-D
Within Groups	8253.02	68	121.37			
TOTAL	17332.00	71				

* $p<.05$

As shown in Table 5, it was seen that the total scores obtained from the evaluators regarding the multimedia screens in the virtual class applications significantly differed depending on the university [$F(3\text{-}68)=24.935$, $p<.05$]. In other words, the scores of the multimedia screens differed significantly with respect to the university. The results of LSD test carried out to determine which groups caused the difference revealed that in terms of use of multimedia screens, Ahmet Yesevi University was significantly better than Sakarya University and Open University, and Wisconsin Technical University was significantly better than Sakarya University and Open University. Based on these results, Ahmet Yesevi University and Wisconsin Technical University can be said to be more

efficient in multimedia designing than the other universities.

Table 6. The Results of Variance Analysis Regarding the Universities and Visual Elements

Variance Source	Sum of Squares	df	Mean Square	F	P	Significant Difference
Between Groups	2149.67	3	716.56	3.625	.021*	A-B, C-B, C-D
Within Groups	7512.45	38	197.70			
TOTAL	9662.12	41				

* p<.05

As shown in Table 6, it was seen that the total scores obtained from the evaluators regarding the visuals in the virtual class applications significantly differed depending on the university [F(3-38)=3.625, p<.05]. In other words, the scores of the visual elements differed significantly with respect to the university. The results of LSD test carried out to determine which groups caused the difference revealed that in terms of use of visual elements, Sakarya Unviversity was significantly better than Ahmet Yesevi University, and Wisconsin Technical University was significantly better than Ahmet Yesevi University and Open University. Based on these results, Sakarya University and Wisconsin Technical University can be said to be more efficient in use of visual elements than the other universities.

3.2. Findings in Terms of Principles of Multimedia Designing

Table 7 below shows the general situation regarding the virtual class applications in terms of principles of multimedia designing.

Table 7. Mean Scores of Universities in Terms of Principles of Multimedia Designing

	Sakarya University	Ahmet Yesevi University	Wisconsin Technical University	Open University	$\overline{X}$	Sd
Multimedia	1.63	2.44	2.25	1.33	1.91	0.52
Spatial Contiguity	1.45	2.47	2.32	1.37	1.90	0.57
Temporal Contiguity	1.40	2.39	2.45	1.27	1.88	0.63
Coherence	1.60	2.17	2.15	1.29	1.80	0.43
Modality	1.35	1.55	1.40	1.05	1.34	0.21
Redundancy	1.30	1.35	1.28	1.03	1.24	0.14

As can be seen in Table 7, the screens in the virtual class applications executed at the four universities generally received scores of 1.91 in terms of *multimedia* principle, 1.90 in terms of *spatial contiguity*, 1.88 in terms of *temporal contiguity*, 1.80 in terms of *coherence*, 1.34 in terms of *modality*, and 1.24 in terms of *redundancy*. The general evaluation with respect to multimedia instructional message revealed that the screens used in the virtual class environment had a low level of effectiveness – problems that could be solved - in terms of the principles of modality and redundancy and a medium level of effectiveness in terms of the other principles. In other words, not enough visuals were used in the multimedia instructional messages; not much correspondence was achieved between the visuals used and the related explanations; the scroll-bar was unnecessarily used; and the visuals and the related explanations were not efficiently made free of the factors that could increase the cognitive load. It is necessary to carry out certain arrangements regarding this issue. In addition, the cognitive load was increased by avoiding the subject of the lesson in such animated pictures as videos and animations used in the virtual class environment or by using texts excessively during the oral teaching of the subject of the lesson.

3.3. Findings in Terms of Use of Visual Elements

The general situation regarding the virtual class applications in terms of use of visuals can be seen Table 8 below.

Table 8. Mean Scores of Universities in Terms of Visual Elements

	Sakarya University	Ahmet Yesevi University	Wisconsin Technical University	Open University	$\overline{X}$	Sd
Concentrated	2.07	1.88	2.18	1.71	1.96	0.21
Concise	2.13	1.91	2.33	1.89	2.07	0.21
Correspondent	2.40	2.12	2.73	2.33	2.40	0.25
Concrete	2.73	1.94	2.36	2.00	2.26	0.37
Coherent	2.80	1.89	2.44	1.82	2.24	0.47
Comprehensible	2.60	1.87	2.27	1.89	2.16	0.35
Codable	2.40	1.74	1.82	1.71	1.92	0.33

As shown in Table 8, the visual elements used in the virtual class applications executed at the universities generally received the mean scores of 1.96 in terms of *concentrated*, 2.07 in terms of *concise*, 2.40 in terms of *correspondent*, 2.26 in terms of *concrete*, 2.24 in terms of *coherent*, 2.16 in terms of *comprehensible*, and 1.96 in terms of *codable*. The general evaluation with respect to visual elements revealed that the visuals used in the virtual class applications had a high level of effectiveness in terms of the principle of correspondent and a medium level of effectiveness – problems that could be solved - in terms of the other principles. In other words, the key concepts regarding the text given were not efficiently emphasized and the picture did not have the necessary features to facilitate memorability. It is also seen that the text and the related visuals were close to each other on the same page; the visuals did not have any remindful effects; and the key words used in the text were not emphasized efficiently in the visuals. Taking these criteria into consideration, the necessary changes should be made in the related learning unit. In addition, the visuals used in the virtual class applications could be revised considering the principles of concise, concrete, coherent, and comprehensible. In other words, the visuals used were made free of unnecessary elements; the features related to the visual quality of the picture were concrete; the logical structure in the text, the subject of the text reflected in the picture were presented in a way to remind the old knowledge; yet certain revisions were still necessary. Regarding the evaluation principles of visual elements, the virtual class applications were found successful only in terms of the principle of correspondent. That is, the picture and the related text were successfully given close to each other on the same page.

Table 9. The Situation at Universities in Terms of Visual Types

Picture Type	Sakarya University	Ahmet Yesevi University	Wisconsin Technical University	Open University	Total	%
Representational	7	39	31	11	88	41.90
Organizational	0	0	1	5	6	2.86
Decorative	0	31	5	16	52	24.76
Explanative	8	25	18	13	64	30.48
TOTAL	15	95	55	45	210	100.00

Moreover, when the visuals used were examined in terms of their types, as shown in Table 9, it is seen that mostly, *representational* pictures (%42) were used in the virtual class applications. In other words, the pictures that show what the element given in the text or used to depict a single element in multimedia instructional messages resembles to were predominantly preferred. Secondly, *explanative* pictures, which are pictures that show how a system works, were used (%30). *Organizational* pictures, which are pictures or schemes that show the relationships between elements, were few in number (%03), yet *decorative* pictures, which are pictures used to motivate readers and draw their attention to the subject, were used intensely (%25).

4. CONCLUSION AND SUGGESTIONS

Consequently, the universities were found to use the visuals in virtual class applications effectively yet to have problems in screen designing appropriate to the principles of multimedia designing. It is also seen that in terms of the visuals used, mostly representational pictures were used. It is stated in the general principles regarding the courses/programs to be opened in the scope of

"Directives for Inter-universities Distance Higher Education Based on Communication and Information Technologies" brought into force in 2000 by the National Committee of Informatics that the visuals to be used in virtual courses under the heading of graphics design and style should not be explained through texts if easily understood; and that unnecessary or unrelated visual decorations should not be used [6]. Similarly, Najjar stated that the pictures to be used in multimedia should be used in a way to support the text, not for decorative purposes [17]. However, it was found out that decorative pictures and textual explanations together with the pictures were predominantly used in the virtual class applications examined in the scope of the study. This revealed the fact that universities even experienced enough in virtual class applications do not use multimedia components effectively. As stated by Demircioğlu [5], it was observed that due to the limited time and the large amount of information load, certain problems were still experienced in the designing of multimedia applications that help individuals to reach information in different ways, take decision on their selves, and to revise and change the information obtained.

Despite the increase in the number of online courses and the spread of online education, it was found that there was no unity between the use of visual elements and multimedia designing within the virtual class applications executed in online courses at the four universities; that each university has its own way of designing; and that not enough attention was paid to the principles of multimedia designing stated in the related literature. In this respect, for the institutions that give online education, the standards necessary for multimedia designing should be determined, and in this way, a unity should be established between educational institutions in terms of online courses. Furthermore, in cooperation with the National Committee of Informatics, the current online courses should be accredited in terms of multimedia designing.

In addition, universities, the final step in an individual's education life, are expected to be a model for other institutions regarding the issue of multimedia designing and thus to be the leader in increasing the quality of online education. Therefore, especially universities should execute virtual class applications taking the principles of multimedia designing into consideration. Besides this, in order to give better as well as global educational service, universities should provide their students with the most developed learning technologies, and the faculty members at universities should know how to use and benefit from these technologies. For this purpose, it is necessary to establish multimedia learning centers at universities [21] and to design functional multimedia materials.

REFRENCES

[1] R. Tannenbaum, *Theoretical foundation of multimedia*. New York: Computer Science Press, 1998.

[2] I. E. Allen and J. Seaman, *Staying the Course Online Education in United States*. United States of America: Sloan Consortium, 2008.

[3] Y. Baykul, *Measurement in education and psychology: Traditional test theory and application.* Ankara: ÖSYM Publications, 2000.

[4] L. Chittaro and Roberto Ranon, Web3D Technologies in learning, education and training: Motivations, issues, opportunities. *Computers & Education*, Vol. 49, 2007, pp. 3-18.

[5] N. Demircioğlu, *Animation in multimedia*. Eskişehir: Unpublished M.A. thesis, Institute of Social Sciences, Anadolu University, 1994.

[6] National Committee of Informatics, Directives for Inter-universities Distance Higher Education Based on Communication and Information Technologies, 2000.

[7] A. Erkuş, *Scientific research helix.* Ankara: Seçkin Publications, 2005.

[8] K. Fraser, Enhancing the pedagogical value of multimedia products in higher education. *International Journal for Academic Development*, 2007, pp. 60-65.

[9] S. Giller and P. Barker, An Evolving Methodology for Managing Multimedia Courseware Production. *Innovations in Education and Teaching International,* Vol. 43, No. 3, 2006, pp. 303-312.

[10] R. Greenlaw, and E. Hepp, *Inline/online: fundamentals of the internet and the world wide web* McGraw-Hill, 1999, retrieved from http://highered.mcgraw-hill.com/sites/dl/free/0072367555/15844/ch02.pdf

[11] D.H. Jonassen and T.C. Reeves, *Learning with technology: Using computers as cognitive tools*. In D.H. Jonassen (Ed.), Handbook of research for educational communications and technology (pp. 693-719). New York: Macmillan, 1996.

[12] N. Karasar, *Research methods in social sciences*. Ankara: Seçkin Publications, 2003.

[13] A. Kuzu, Y. Akbulut and M.C. Şahin Application of multimedia design principles to visuals used in course-books: an evaluation tool. *The Turkish Online Journal of Educational Technology – TOJET* April 2007 ISSN: 1303-6521,2007, Vol. 6, Issue 2, Article 1.

[14] C. Maddux, D. Johnson and J. Willis, *Educational computer: learning with tomorrow's technologies*. Boston: Allyn and Bacon, 2001.

[15] R.E. Mayer, *Multimedia learning*. Edinburg: Cambridge University Press, 2001.

[16] R.E. Menne and J. Menne, The relative efficiency of bimodal presentation as an aid to learning. *Audio Visual Communication Review*, 1972, Vol. 20, pp. 170-180.

[17] L.J. Najjar, Principles of educational multimedia user interface design. *Human Factors*, 1998, Vol. 40, No. 2, pp. 311-323.

[18] P.M. Raupers, Effects of accommodating learning style preferences on long term retention of technology training content. *National Forum of Special Education Journal*, 9E, 2000.

[19] J.E. Schwartz and R.J. Beichner, *Essentials of educational technology*. Boston: Allyn and Bacon, 1999.

[20] M.E. Sezgin, *The effect of the multimedia course software prepared based on dual coding on academic achievement, learning and memorability in the course of science*. Adana: Çukurova University, Unpublished M.A. thesis, 2002.

[21] A. Şimşek, *Establishment of multimedia learning centers at universities*. National Symposium of Turkish Education System on the verge of the twenty-first century. Ankara: Öğretmen Hüseyin Hüsnü Tekışık Education and Research-Development Center, 1999.

* The first draft of this paper has been presented at the 8th International Educational Technology Conference (IETC 2008) in the Turkey, and published in the Conference Proceedings.

BIOGRAPHY

Assist.Prof.Dr. Abdullah KUZU is a faculty member at the Department of Computer Education and Instructional Technologies at Anadolu University. He has a Ph.D. in educational technology. He conducts action researchs on designing online learning environments for hearing handicapped and visually handicapped children. and offers courses on current trends and issues in instructional technology, research problems in instructional technologies, qualitative research designs and multimedia learning.

Lect. Ömer UYSAL is an instructor and PhD student in the Computer Education and Instructional Technologies Education Department of Education Faculty, Anadolu University, Turkey. He has an M.A. in the same department with emphasis on computer ethics, multimedia learning and conducts research on the subjects.

Kerem KILIÇER is a research assistant at the Graduate School of Educational Sciencies at Anadolu University. He has PhD student in the Computer Education and Instructional Technologies. He conducts research on diffusion of technological innovation, innovativeness, multimedia learning and ICT integration.