# DECLARATION OF EDUCATIONAL TECHNOLOGY IN THE LAST CENTURY THROUGH A GRAPH TREE

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## 1. ABSTRACT

The foundations of Graph Theory was laid by Leonhard Euler in 1736. Graph Theory investigates the relationships among the concepts mostly in math and computer science via graphs. In the literature you see the use of it in logistics, math, computer science, education, chemistry and engineering. It provides visuals about the issue and facilitates stimulating the subject in mind with a concept map.

The aim of this study is to present the history of educational technology from the 20th century to the present through a Tree Based Graph. It's been intended that graph theory is a good way of transferring the issue with its chronological information and showing relationships among the related issues like a web. Through the Graph Tree horizontally and vertically related improvements are shown chronologically and the photo is illustrated as a whole. Thanks to this study, instructors not only will be able to see a different function of the graph theory, but also use it as a technique to express an issue chronologically and enhance their expression with visuals.

Keywords: Tree Graph, Graph Theory, Educational Technology, History of Educational Technology

## 2. INTRODUCTION

The concept of educational technology in the literature is difficult to find in the past centuries. The reason for this, technology hasn't developed in those years as the present, yet. In history, educational technology began with the discovery of writing, and educational technology was the equipments such as paper, scissors, pens, boks, etc. For this reason, instructional technology is used instead of educational technology. In 1930s, the concept of educational technology, refered to the physical tools such as a projector which is used for demostrating materials. In this era, educational technology is perceived as an environment or product and in short it was defined as audiovisual tools (Meirhenry, 1984: 372). After 1955, the result of the reflection of developments in communication technology in education, formal education started to develop. Radio and television were used for this purpose and with satellite technology that became very wide and when the connection was established, it turned into a training tool that is used among countries. Video was also used for visual appliances for training purposes (Kunc, Varol, :41-46). Educational technology actually started to reveal after World War II thanks to the scientists such as Skinner and Finn. They supported the visual and auditory learning and the first definition of educational technology was audiovisual communication. In line with the developments in science and technology, the developments in the field of education was compulsory. Behavioral and cognitive approaches in the field of education changed as programmed instruction and constructivist approach in time. After the 1960's, the process became important, not only the product.

"Responses given to the quetion "what is educational technology" have changed significantly within time" (Seels & Richey, 1994: 20). A chronological examination of the development of these definitions is important in terms of educational technology. Definition of educational technology has been interpreted and changed dozens of times until 2004. However, none of these definitions irrefutable; on the contrary, each other is increasing by adding all these ideas, it is very important to combine them in a philosophical way (Şimşek, 2005). The following definitions are a few examples of them.

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"Educational technology is all of the techniques that enable individuals to gain all of the desired behaviors through their own experiences. In the general sense, educational technology is components which are involved in the learning activity such as covers, vehicles, equipments, processes, elements and methods, (Okan, 1976).

"Thinking the concept of educational technology as only a tool or media, reveals that it is being misunderstood and resricted. Educational technology seeks to answer the question of how and by what means, which tools, methods and staffs can we reach the objectives determined" (Anderson, 1974: 342).

"Educational technology is the study and ethical practice of facilitating learning and improving performance by creating and using and managing appropriate technological processes and resources" (AECT, 2004).

As it can be understood from the definitions of educational technology we see that it is interpreted differently within time. It had been focused on methodology, techniques, methods, tools and assessment tools, in 1970s it was focused on the process, the concepts of management and implementation are included there, it in the 2000s using, creating, performance development, ethical practice, and concepts of the study have been added.

Before the 19th century, it is not encountered the studies in the field of educational technology. The first studies about educational technology began under the pressure of instructional technology in a manner that is independent of educational sciences and educators at the beginning of the 20th century (Şimşek, 2005: 178).

Okan (1976), in his book he expresses the educational technology center. There are 16 mm first tutorial movie collections, 35 mm film strips, slides, and bands of tape in this centre. It is understandable that the visual education was important in that period. Today's teachers may not have heard even their names. However, it is important to know how today's educational technology be formed. Lupicinio (2005) tells us that educational technology's future is in the hands of the thinkers. To have knowledge about the past, understand the present, and will enable you to shape a better future. The purpose of this study is to present the history of educational technology with a tree graph from the beginning of the 20th century to the present. At he end of this study teachers will see a concept map and a tree graph of the educational technology. Thanks to this study they will able to be aware of and will be able to use this method for similar presentations in their courses.

Educational technology was examined under three main headings including auditory technologies, , television-based technologies, computer-based technologies.

## 2.1. Auditory Technologies

### 2.1.1. Radio

British scientist James Maxwell established the theory of propagation of radio waves generated electronically in 1860. In 1888 the German physicist Heinrich Hertz pioneered Maxwell's theory in this regard by performing practically. Radio was born officially with Marconi in 1895. Adapted from the ship to the beach in the first use of radio; by using in many areas such as safety, business, agriculture, transportation, entertainment, communication in areas such as overseas, it has become common (Kaya, 2015).

First continuous radio transmitter started to work in the United States on November 2, 1920. The number of stations in the U.S. broadcasting on a regular basis in 1921 rose to 4, and in May 1922 rapidly increased to 29% percent, in December of the same year the number has risen to 392. That followed in other countries; in 1922, in England, France, Soviet Union, and in 1923 radio broadcasts began in Germany, and then, respectively, until 1927 in countries such as, Argentina, Australia, Italy, Japan, Norway, New Zealand, the Netherlands, Sweden, Switzerland, Czechoslovakia, Union of South Africa; radio broadcasts began and spread all over the world. The invention of FM band and stereo broadcast in 1955 are major steps in the development of radio (Aziz, 1981: 10-11).

Radio was used by the University of Wisconsin in America in 1916 for the purposes of distance education, The Ministry of Education in UK began to support courses by radio in 1920 and the use of the radio after 1925 widespread all over the world in Distance Education (uzaktaneğitin.com)

Following communication the most important function of radio and television is education. In countries that have failed to complete the development of radio and television has been used effectively as a training tool. In advanced countries, it has a complementary function in education. The illiterate, school dropouts, people wanting to continue their education in distance, not having the opportunity to go to school, and who want to improve their abilities, met their training requirements with television and radio. The function of radio and television are collected under two main headline, formal and informal education (Aziz, 1981: 52-54).

### 2.1.2. Audio cassette

Because tapes are inexpensive and audio tapes are of low cost, portable, easy to be reproduced, has made the audio tapes attractive (Barnard, 1972: 136). After Philips invented the audio tape in 1963, videotapes and audio

tapes are started to be used in programmed instruction in the 1960s. This development, has brought a new discipline to instructional technology as well. Since it provides students a chance to listen to the lessons anytime they want, it has been used in Distance Education (Westenra, 2012: 3). Audio cassette has been effective in the education of visually impaired persons. Audio tapes have been used for many years in foreign language lessons and there has been an effective tool to convey students how they speak the target language. Today, it has been replaced by MP3 and CDs.

### 2.1.3.Telephone

Medias such as cassette, slide, and film, are helpful for education. Attendance of experts from areas such as politics, literature, science fields, with telephone conversations and interviews in a tutoring environment is an example of the use of a different visual media in education. Even though the telephone was invented by Alexander Graham Bell in 1876, the contribution to provide telephone conference to enter the classrooms in the College has not been fully recognised. Since 1958, Stephens College, Columbia, Missouri, have begun to use this application in the classroom. During 1963-1964 in classes and in colleges it has continued to spread ( Jolly, Madden, 1965: 1-2)

According to Nurgent (1987), telephone conferences, eliminates the need for people to move from place to place to get together and allows students in a messy system to communicate with phone conferencing at the most appropriate time for themselves. Another facility that telephone conferencing provides, feedback can be given immediately.

### 2.2. Television-Based Technologies

Even radio and television are often mentioned together because radio is only an auditory aid and the TV also adds a visual element, the invention of the TV was later than radio (Saints, 1981: 7). The first successful broadcast test of TV which is an effective aid in providing equal education to the masses was conducted by Alexanderson, Baird and Farnsworth in 1926. Commercial television broadcasts have been started to be used in the 1940s, educational television has been implemented in the 1950s. The reason for the spread of television teaching in a short time is, the need to remove the lack of teacher and classes in the 1950's, upgrade the quality of teachers, benefit largely from qualified teachers and obligation to educate large student audiences at little expense. The purposes of the use of television in education are ranked as; analysis of the problem of literacy and basic education, extend educational services, space-saving, cost reducing, upgrade the quality of education, value teacher's time and improve the quality, adult education and acceleration of community development services. USA was the founder of the first television school in 1952. In this country, featuring 370 closed circuit in 1963 and 111 open circuit and 900 closed circuit television in 1966, more than 10,000,000 students benefit from this instruction (Alkan, 1977: 179-194)

### 2.2.1.Television Teaching

Television teaching criticized by some people on to replace teachers. TV that provides visual and auditory training invented in 1928, and has become widespread in the 1950s. Before 1950s, although there are many examples in the field of television teaching, by the foundation of Federal Communications Commission and with funds from the Ford Foundation this development has been revived. In 1963, the Ford Foundation, has taken the decision to support television teaching not only in schools but also on Public Television. At the end of all this work, in 1967, the Carnegie Commission of Instructonal Television suggested that television has a small effect on education and does not have the expected potential in practice. The major reason for this, teacher's resistance not to use this new technology in the classroom, TV has failed in providing different environments necessary for the student and requiring high cost.

Educational programs on TV addressed to specific audiences, such as children and village in the early years. In time, the changes that occur in the agenda of the institution have caused changes in the program as well. In recent years, the enriched programing has started to be the products of the supply-demand relationship in a way (Akt. Varol, 1997: 110).

After the invention of television it has been realized that the impact of the image in education is huge and instructional publications have taken place regularly. Even, while the TV is yet in the experimental stage, broadcats were made for educational purposes. For this purpose, in the United States between the years 1932-39 at Iowa State University educational broadcasts were made, regular educational television broadcasts are made for the first time with electronic scanning in Texas in 1953. In the 1960s, closed circuit school publications were widely used in education. During those dates the number of open circuit television stations that established for educational purposes and broadcasting reached to 97 in the early 1980s (Aziz, 1981: 54).

### 2.2.2. Video Cassette

Video cassette was invented by Luigi Marzocchi in1938. Video cassette as, audio cassette, introduced in the 1960s. Since it was able to save both the audio and the image it is suitable for audiovisual training. However, when compared to the audio cassette, because of high cost its use was limited. With the emergence of new media such as microcomputer, multimedia CD-ROM and DVD, the interest in video cassette has decreased.

### 2.2.3. Video Disc

Video discs, were introduced in America in 1972 and in Europe in 1982. Video discs are durable and also easy to use (Duffy, Judy, 1991: 9). When the articles that are written in educational technology are examined, as writers like Schneider and Bennion, mention the use of video cassette in education, it can be understood that video discs have become widespread in the 1980s.

### 2.3. Computer-Based Technologies

The history of the computer is based on the Abacus that invented 2000 years ago. Before computers transform their current form, calculator in 1642, automatic calculator in 1823, punch card system in 1890, the Mark I in 1944, the ENIAC in 1946, and in 1951 the first commercial computer the UNIVAC, PLATO in 1960, PC in 1970, CD-ROM in 1980, and in 1981 IBM was developed. The access to today's portable computer is possible after a long time (Madran,2015).

A change of training approach, with the development of training programs and technology, computer has appeared in education. Since it is both visual and auditory and allows to reach the desired information at any time, it surpasses radio and television. The purpose of computer application is not only to automate learning, but also to provide effectiveness in the process of teaching and learning, continuity, integrity, equity, currency, diversity. Today, performing education and training with the computer has become compulsory. Computer provides main facilities such as, offering the students who missed the class, the opportunity to continue their studies, providing individual teaching practice, offering teachers the opportunity of continuous monitoring of students and help, increase efficiency in classwork, work-related records keeping, group support and time saving for the teacher (Alkan, 1977: 197-220).

The first country that use the computer for educational purposes is Italy. Although the United States began to use the computer for educational purposes nearly a decade later than Italy, today it ranks among the most advanced countries in the educational use of computers (Seferoğlu, 2015).

### 2.3.1. Computer-Assisted Learning

After the interest in the television lost in education, the attention of the educators turned to a new technology, Computer Technology. IBM researchers has developed the first instance of computer in education, computer assisted instruction (CAI), to be used in public schools in the 1950's. Plato and TICCIT were developed in the 1960s and 1970s. Although there was a great interest in computers as the public cannot get the micro-computer yet, the use of computer assisted instruction has become widespread in the 1980s. By February 1983, computer in America has been used in 75% of secondary schools and 40% of high schools.

### 2.3.2. Computer Conference

First computer conference was carried out in 1959 under the sponsorship of UNESCO. By using electronic conferencing, the learner can connect to one or more computers at the same time with his friends. By creating discussion groups students can benefit, in enriching their instructional experiences with a cooperative learning process and in reducing the feelings of isolation (Duffy, Judy, 1991: 11).

### 2.3.3. Computer Labs

Electronic learning laboratory is different from the lab where scientific experiments are made. In this environment, students do not do experiment, they feel and have experience on what they study. Practice of automatic classroom and foreign language labs are the examples. Language labs have a fairly common usage (Alkan, 1984: 152). The foreign language labs have been developed in 1957, after the launch of Sputnik, the first artificial satellite. Foreign language teachers who are in need of a new method, has met this new technology enthusiastically. Afterwards, the institutions have established this new system by paying large amounts of fees (Demiröz, 2004: 29).

### 2.3.4. The Use Of Internet In Education

The internet first developed in 1969 to be used mostly in the military field by the Department of Defense with the name of ARPANET. It also appeared in the field of education in 1973 and used by some universities. Thanks to the rapid changes in computer and digital technology and internet, after 1995, the use of computer in education had its golden age. While there was one computer available for every nine students in America in 1995, it was available for every six students in 1998. The main purpose of Internet-Assisted Instruction (IAI) is

to ensure each individual receive training in any place that he wants to improve himself without the constraints of space and time (Çetin, Çakıroğlu, 2004: 146). This definition recalls the purpose of distance education. Owing to the computer and the internet there has been cost reduction in distance education and since access to information is easy the demand has increased. The academic year of 1994-1995 compared to 1997-1998 academic year in America the rate of distance educatio doubled (Reiser, 2001: 60).

The foundations of distance education began with letter. With the development of technology, the birth of computer and internet, it has spreaded rapidly in Great Britain, France, Germany, the USA and many other countries. The first remote training began with Boston newspaper in 1728 and composition lessons with letter at the University of Sweden was given to the ladies in 1833, and the first Department of education with letter was opened at the University of Chicago in 1892. The distance education in Turkey began with the establishment of center of education with letter in the Ministry of National Education in 1961 (uzem). During this period, even student evaluations were done by letter. However, it is hard to study, understand and succeed. Students couldn't get easy access to another source except for their books as today. Thanks to the internet using distance education online courses and programs has increased the popularity of distance education. Distance education has been preferred nowadays because it eliminates the necessity for individuals to enter the classroom environment, saves time and allows them to study at the most appropriate time for themselves. It also has provided training opportunities for individuals with physical disability or who have to work.

### 2.3.5. The Use Of Social Networks In Education

After the invention of the computer and the internet the first social network, Compuserve, began to be used for commercial purposes in America in 1969. In 1989, with the World Wide Web (www), social networks bagan to develop. There was a large increase in the 2000s, and many social networks such as Facebook, Myspace, Twitter and Youtube, was used in education effectively. Social networks; as contributing to student-teacher and student-student communication and the sharing of course content, provide students to use their time efficiently on the computer, students can review the course any time they want, allows group work and collaborative work.

### 2.4. A General Overview Of Educational Technology In Turkey

The council decisions of the Ministry of Education shows Turkey's status clearly, in gaining access to technology in education. The first of Council Meetings of the Ministry of were organized under the chairmanship of the Minister of Education Hasan Ali Yücel in 1939. But from the I. meeting to the XII. meeting of the council, because of the needs of the period they focused on the issues such as school, teacher training and public education, so did not utter a word of the technology. The technology is noticed for the first time, at the XII. Council Meeting of the Ministry of Education in 1988, and was discussed in detail with a substance about new technologies in education. 25 decisions has been taken about the technology. After that, the importance of technology in education has been understood and the necessary measures have been taken.

The common features of television and radio mass communication which are visual and auditory that they are electronic and appeal to a large audience. Turkey's first radio broadcasts has started in 1927, and television broadcasts in 1968, but have not been used actively in training. After passing through several stages, educational radio broadcasts began in TRT management in 1964, and made progress in the programmes. Publications of educational content based on the new publication, which started in 1975 (Akt. Varol,: 9). In terms of utilization of the television Turkey fell behind other countries. The first broadcast, has started experimental and in the closed-circuit system at the Istanbul Technical University in 1954 (Alkan, 1977: 194). In our country, the school radio and school television prepared by the Ministry of education, broadcasted by taking the technical advantages of TRT, the Yay-Kur programs can be shown as an example of radio and television broadcasts (Saints, 1981: 53)

The first computer in Turkey was an IBM 650 in 1960. It was brought to the General Directorate of Highways in order to make road calculations. Second computer was brought for Istanbul Technical University and the third computer for Middle East Technical University; and thus computer was used in education. Turkey has the internet connection since April 1993. The first connection was carried out from METU.

It is conceivable that foreign language labs newly used in Turkey in 1970s since in Ankara University Faculty of Education, in 1973, Sarıoğlu introduced foreign language labs to foreign language teachers and Kücükkalıpçı gave two seminars titled foreign language lab and issues emerging in practice.

### 2.5. Graph Theory

Graph theory which has many fields of application, has emerged with the problem of the seven bridges of Königsberg that Euler's published in 1736. We briefly mention this problem in the following way; there are seven bridges connecting the four mainland of the city. Starting from any point of this city, provided to cross

each bridge exactly once and coming back to the starting point. Euler proved that the solution of the problem is not possible with the help of Euler's graph (Trudeau, 1993).
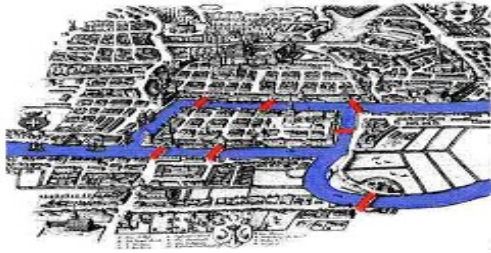


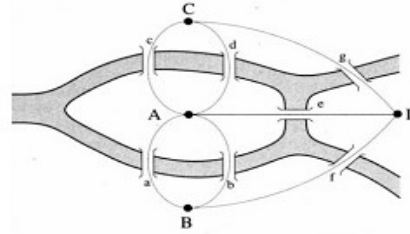Figure1: Könisberg's Seven Bridges                         Figure 2: Euler Graph

After Euler's proven, Hierholzer, Fleur who are mathematicians have developed manual-off ' discovery algorithms such as Euler diagram. Also Kirchhoff's electricity networks, Cayley's organic chemical isomers and Hamilton's studies in various fields, graph theory has taken an important place such as in many branches of science, physics, chemistry, and engineering, (Golumbic, 1980).

We see the degree, connectedness, path, rev, trees, planar graphs in graph theory; Euler and Hamilton cycles plays an active role in solving problems such as basic definitions and concepts in various fields. For example, graphs is known for in the order of hyperlinking, finding the shortest path with the help of GPS, representing electron energy levels of the molecules (Bondy & Murty, 2008).

In the last 20 years, both in everyday life and in the field of science studies the elements and their relationships of a problem, graph theory is used to find the solution more easily.

### 2.5.1. Tree Graph

In this study, the tree graph, which is a type of the graph theory will be used. Tree graphs are connected graphs that do not involve the transfer (Mutlu, Çakır, and Büyükköse, 2015).
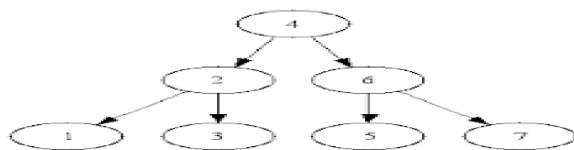


Figure 3: Tree Graph

The concept maps also use tree graphs. Concept map is a teaching method that aims to provide concrete data and the relationship between concepts, visualize concepts to make it understandable. Based on meaningful learning, concept maps provide more permanent and long lasting learning instead of memorization. In recent years, concept maps, teaching and assessment strategy, is used for introducing new units, identifying students' readiness, discovering misconceptions and elimination of uncertainties, summarizing what was learned and assessment of learning (Mutlu, Çakır, and Büyükköse, 2015).

### 2.5.2. Combining The History of Educational Technology with A Tree Graph

Graph theory, examines the relationship between concepts in terms of graphs mostly in the fields of mathematics and computer science. Looking at the literature, graph theory is used the fields such as logistics, mathematics, computer science, education, chemistry, and engineering. Theory, allows you to be revived issues in memory and visually displayed in the concept map. In examining the process of historical development, while giving the connections between these developments and chronological information and in order to support it visually setting up the tree graph is an appropriate tool. The educational technology and the age of it is a fact that teachers need to use and must know. It is important for teachers to know the historical development of it. To make the presentation visual and stimulate historical development of it in the minds educational technology integrated with the graf tree.

### 3. METHOD

In this study, historical research model was used. This is a descriptive study. The historical development of educational technology researched, revised, and submitted. This study constitutes a presentation with the method of graph theory.
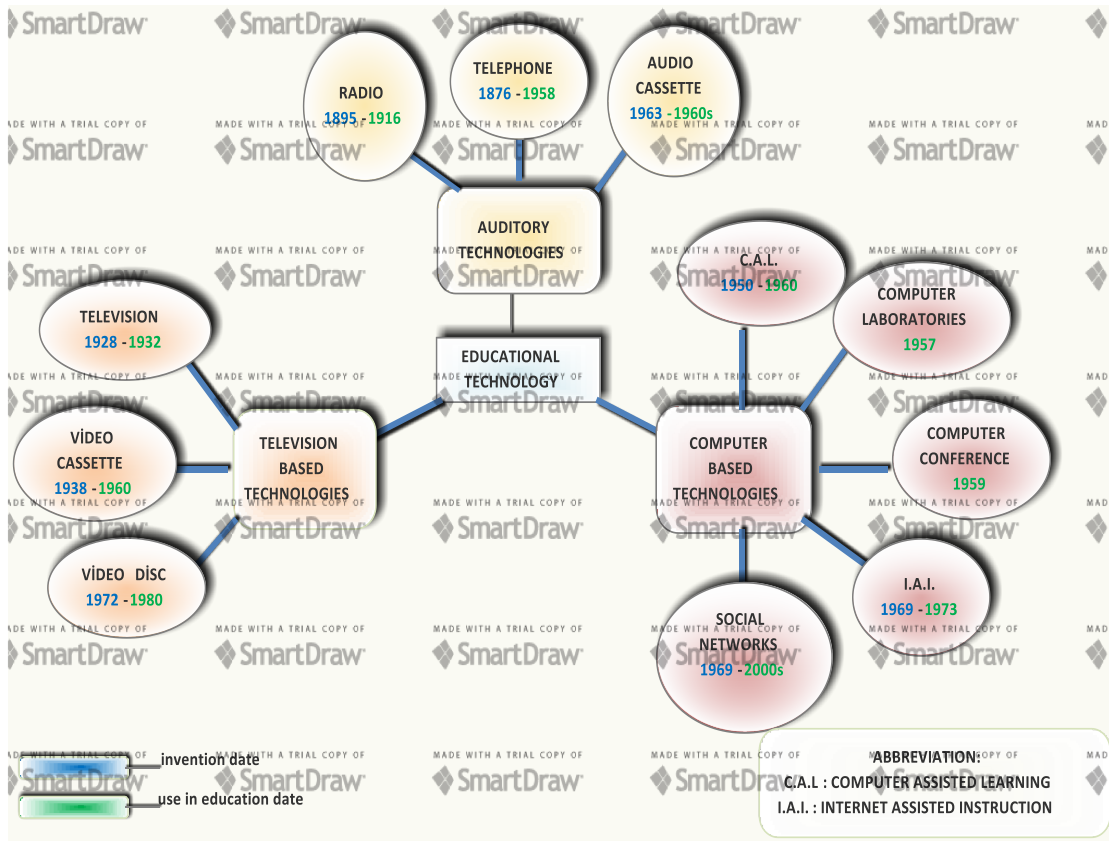
### 4. FINDINGS

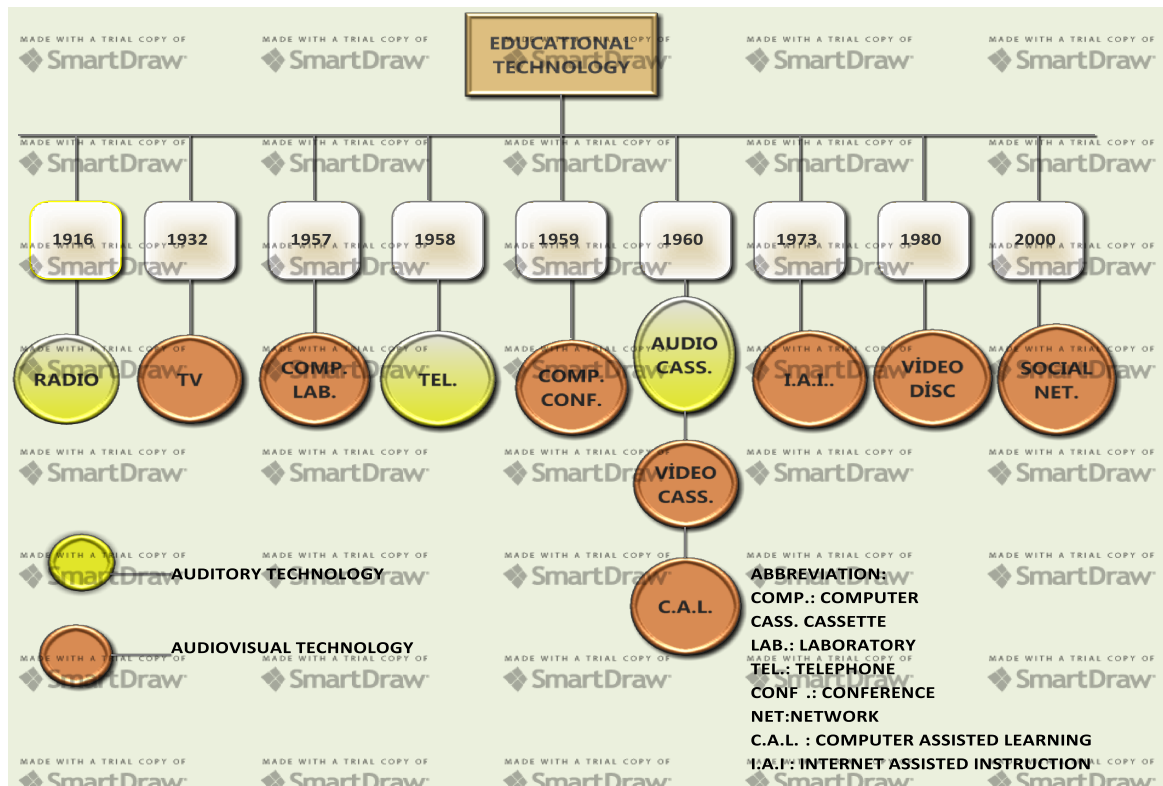Figure:4 The Concept Map of Educational Technology



Figure: 5 The Chronology of Educational Technology with Tree Graph

## 5. CONCLUSION AND RECOMMENDATIONS

The history of educational technology in the last century was examined in terms of auditory technologies, television-based Technologies and computer-based technologie. After that, we create a concept map and present these technologies with a tree graph from a chronological perspective,. Thus, the teachers will be able to see clearly how educational technology has evolved in the last century. Teachers can use concept maps and tree graph methods to provide a meaningful learning in their instructions while expressing a subject in their classrooms.

## REFERENCES

AECT (2004) The Definition of Educational Technology by Association for Educational Communications and Technology Definition and Terminology Committee .

ALKAN, C. (1974) Eğitim Teknolojisi, Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi Cilt:7 Sayı:1 S:339-344.

ALKAN, C. (1977) Eğitim Teknolojisi Kuramlar ve Yöntemler Ankara: Yargıçoğlu Matbaası.

ALKAN, C. (1984) Eğitim Teknolojisi (2. Baskı) Ankara: Yargıçoğlu Matbaası.

ALKAN, C. (2005) Eğitim Teknolojisi (8. Baskı) Ankara: Anı Yayıncılık.

AZİZ, A. (1981) Radyo Ve Televizyona Giriş, Ankara Üniversitesi Siyasal Bilgiler Fakültesi Yayınları No. 460.

BARNARD, R.W. (1972) Teaching Aids, Journal of Chemical Education, 1972, 49(2):136-138.

BONDY, J.A., MURTY U.S.R. (2008) Graph Theory, USA, Springer

CETİN, O., CAKIROGLU, M., BAYILMIŞ, C., EKİZ, H. (2004) The Turkish Online Journal of Educational Technology – TOJET July 2004 ISSN: 1303-6521 volume 3 Issue 3 Article 17 S:144-147.

DEMİRÖZ, H. (2004) Modification of Language Laboratories into Computer Assisted Language Learning Laboratories, (Yayımlanmış Yüksek Lisans Tezi). Cumhuriyet Üniversitesi/Sosyal Bilimler Enstitüsü, Sivas

DUFFY, L.,JUDY, C. (1991) Distance Learning: An Alternative in the Information Age, Paper presented at the Conference of the League forCommunity College (San Diego,1991).

ERGÜN,M. (1998) İnternet Destekli Eğitim, Afyon Kocatepe Üni. Sosyal Bilimler Dergisi,Sayı:1,1998.

GOLUMBIC, M. (1980) Algorithmic Graph Theory And Perfect Graphs, Academic Press

JOLLY, J.,MADDEN, C. F. (1965), Amplified Telephone As A Teaching Medium,  Stephens Coll., Columbıa, Mo.Report Number Sc-Educ-Rep-1pub

KAYA, F. (2015) Bilgisayarın Tarihi, http://ari.cankaya.edu.tr/~figen/bilgisayarin%20tarihi.htm Erişim Tarihi: 05.05.2015.

KAYA, F. (2015) Radyonun icadı, ari.cankaya.edu.tr/~figen/radyo.htm Erişim Tarihi: 09.05.2015

KUNÇ, Ş.; VAROL, AA.: 21. Yüzyıl Eğitiminde Teknoloji Kullanımı ve Mesleki Teknik Eğitim, Endüstriyel Teknoloji, Bilimsel ve Teknik Dergi, Cilt 1, Sayı 1, Kasım 1994, S:41-46.

LUPPICINI, R. (2005) A systems Definitions Of Educational Technology in Society. Educational Technology & Society , 8 (3), 103-109.

MADRAN, R. O. (2015) Bilgisayarın Tarihçesi
http://moodle.baskent.edu.tr/pluginfile.php/28/mod_resource/content/0/ek_kaynaklar/bilgisayarin _tarihcesi.pdf Erişim Tarihi:  03.03.2015

MUTLU, N., ÇAKIR, Ö., BÜYÜKKÖSE Ş., (2015) Graf Teorinin Kavram Haritalarına Uygulanışı, II. Kadın Matematikçiler Derneği Çalıştayı, Cumhuriyet Üniversitesi, Sivas, 01-03 Mayıs 2015

NUGENT Gwen C. (1987). Innovations in Telecommunications. In Robert M. Gagne (Ed.), Instructional technology: Foundations. (pp.261-282). Hillsdale, NJ: Lawrence Erlbaum Associates.

OKAN, K. (1976) Eğitim Teknolojisi, Ankara Kütüphanesi Eğitim Fakültesi Kütüphanesi (Y. No:371.33).

ÖZDİL, İ., Uzaktan Eğitim Teknolojisi, Eskişehir, 1985. (Akt.  VAROL, N. (1997) Radyo ve Televizyonun Eğitim Amaçlı Kullanımı, Türk Cumhuriyetleri ve Asya Pasifik Ülkeleri Uluslararası Eğitim Sempozyumu, 24-26 Eylül 1997, Elazığ, S: 108-115.

REISER, R.A. (2001), A History of Instructional Design and Technology: Part I:  A History of Instructional Media ETR&D, Vol.49, No.1 p:53-64.

REİSOĞLU, İ., Karoğlu, K. A., Gedik, N., Göktaş Y., Çağıltay, K., (2013)  Öğretim Teknolojisnin Türkiye Tarihine Bir Bakış 1920-1984 Dönemi,  Öğretim Teknolojilerinin Temelleri (S. 23-39), Ankara: Pegem.

SEFEROĞLU, S. S. (2015) Bilgisayarın Eğitim ve Öğretimdeki Yeri,
        http://yunus.hacettepe.edu.tr/~sadi/dersler/ebb/ebb467-guz2000/ugurt-p.html Erişim Tarihi: 03.03.2015

ŞİMŞEK, N. (2005) Perceptions and Opinions of Educational Technologists Related to Educational Technology. Educational Technology & Society, 8 (4) , 178-190.

TRUDEAU, R .J. (1993) Introduction to Graph Theory, New York ,Daver Publication.

UZAKTAN EĞİTİM RADYO VE TELEVİZYON DÖNEMİ (2014) https://www.uzaktanegitim.com/hbrd192-uzaktan-egitim-radyo-ve-televizyon-donemi.aspx Erişim Tarihi: 10.05.2015.

UZAKTAN EĞİTİM TARİHİ, Mehmet Akif Ersoy Üniversitesi – Uzaktan Eğitim Uygulama Ve Araştırma Merkezi,   http://uzem.mehmetakif.edu.tr/Makuzem/8/Uzaktan-E%C4%9Fitim-Tarih%C3%A7e  Erişim Tarihi: 10.05.2015.

VAROL, N. (1997) Radyo ve Televizyonun Eğitim Amaçlı Kullanımı, Türk Cumhuriyetleri ve Asya Pasifik Ülkeleri Uluslararası Eğitim Sempozyumu, 24-26 Eylül 1997, Elazığ, S: 108-115.

WESLEY, C. M. (1984) A Brief History of Educational Technology, Educational Media Yearbook, Libraries Unlimited, Inc. Littleton, Colarado (Çev. Akif Ergin, dergiler.ankara.edu.tr/tammetin.php?id=606 Erişim Tarihi: 10.05.2015.

WESTERA, W. (2012) The Eventful Genesis of Educational Media, CELSTEC - Centre for Learning Sciences and Technologies, Open University of the Netherlands.