

INFORMATICS EDUCATION IN DIFFERENT DISCIPLINES AT UNIVERSITY LEVEL

CASE STUDY: A SURVEY OF STUDENTS' ATTITUDE TOWARD INFORMATICS TECHNOLOGIES

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ABSTRACT

This article presents a quantitative study on attitudes toward the usage of Information Technology related tools and applications. The study was conducted at a private university, Turkey, with 97 female and 113 male students involved as participants. They were each presented with a questionnaire to relate their attitudes toward IT and after undergoing a discrete IT course for the duration of one semester (15 weeks). The attitudes of the respondents were measured in terms of three dimensions, namely, usefulness, confidence and learning. Both genders exhibited the same levels of attitudes after undergoing the comprehensive IT course. The largest improvement for females and males was in the learning dimension which showed that their initial dislike toward IT was greatly reduced at the end of the course. In terms of confidence, female and male participants exhibited an enhanced confidence level after the course. One area of information technology quickly becoming ultimate is the field of Informatics. Information technology is the area of managing technology and spans wide variety of areas that include but are not limited to things such as processes, computer software, information systems, computer hardware, programming languages, and data constructs. To meet this growing need universities are beginning to develop degree programs with the integration of Informatics. In response to the widespread use of and ever-changing nature of Informatics, various investigations were carried out regarding attitudes toward informatics. Employing people who understand Informatics is a top priority for industries, business, government, education and the military sectors. Informatics can be defined as the multidimensional use of technology to support knowledge discovery assisting the decision maker to achieve the organizational goals. Informatics incorporates the way data is collected, organized, analyzed, represented, filtered and managed. Totally this paper attempted to investigate university student attitudes toward the integration of Informatics Technology in their departments and factors contributing to their attitudes so as to provide some constructive information and suggestions for the adoption of technology in informatics education.

INTRODUCTION

The rapid changes that take place in science and technology and developments also affect communication and information technology to a great extent. The rapidly spreading improvements have been felt in all parts of life. These transformations and developments have accelerated the creation, expansion, sharing and utilization of knowledge and they have also become the basic components in public services and economy as well as in information training. It is not quiet logical today to say that only acquiring knowledge is meaningful. Contributing to information production, acquiring changes and improvements as soon as possible and using these are the greatest targets of the modern societies.

When talked about computer assisted learning today in the world, it does not mean computers confined to laboratory settings anymore, instead the holistic outlook of countries to their education systems; a design and problem solving process come to mind. In order to be successful and productive in today's society, even more important than that, to build the inhabitable society of tomorrow, it is necessary for learning to learn, thinking to learn and coming to a understanding on how technology can be used in humanity's service.

Technology greatly affects daily life when looked to school walls. Technology has become an indispensable part of individual life in various areas from ATM's to internet connection. In most of the workplaces, technology usage has become the most preferred knowledge and skills.

In educational environments, the speed of the technological developments suitable to be used in these settings is unfortunately faster than the understanding of the value which these new equipments have contributed to and the pace of applying conscious applications. Therefore, naturally, negative and useless consequences such as the worshipping to technology, seeing the hardware side of technology as a must or having firm dependence emerge. In fact, the way of taking advantage of technological capabilities is more than only acquiring hardware and having internet connection.

As information technology has become the measure of successful performance both in business world, at school as well as in academic areas in recent years the need to integrate technology within educational activities have emerged in many parts of the world. The changing world order, by revealing concept of globalization, have the increased the importance of factors such as competition, and price in the world economy. An intense competition has been observed in the world economy together with the improvement of the information technology, the abrogation of custom walls and the international trade liberalization efforts. In this context, the opportunities brought by technology push the institutions to provide more vigorous and efficient services in global settings.

PURPOSE OF STUDY

The rapid IT developments in the Turkish education system in the past decade, have influenced expectations from higher institutions in Turkey. These institutions are expected to train and equip graduate teachers with adequate knowledge and skills to utilise Information Technology as an effective tool in their teaching practices. In this study, the following research questions were investigated:

1. How are the Student attitudes toward the integration of Informatics Technology in their departments and factors contributing to their attitudes?
2. Are there gender differences in attitudes towards IT among the students before their enrolment in the Informatics Technology course?

Today, a number of researches have been made in the integration of computer-aided applications in universities Here, two issues strike one's eyes. The first is that the studies done are not completed truly towards the interdisciplinary education and the second is that the concept of information technology is seen from technology perspective. Based on this deficiency, studies that help the retention of information more easily should be done. Technology stands out as a numerical concept. However, there are a lot of departments which are not numerical/quantitative and students of them are present in universities. In order for these students to comprehend issues in their field faster, they need information technology point of view. The main goal of information technology is not only rendering the easy usage of information technology equipments but also helping the retention of information longer in human mind, therefore, fostering the consolidation of new information. So as to provide this, the information technology concept should be transferred with interdisciplinary mentality. For this, the curricula of different disciplines ought to be examined and the most convenient information technology elements to be applied should be determined.

INFORMATION TECHNOLOGIES AND THEIR INTEGRATION

The concept of data processing can be briefly defined as the result that is produced when technology and information is jointly utilized. Data processing has some aspects: computer software, computer hardware, and computer user and information society. We can define data processing the results we attain when information and technology are jointly used. The English term information technology (IT) is Turkish equivalent of information and information technology. The second most important element of information technology is computers. The computers are composed of computer programs (or software) and the electronically physical components (or hardware) and these are two basic units. Previously, we were writing letters to our relatives and friends but nowadays we can write an email with the aid of a computer and send it. Also we can make net meeting with a camera and a computer. The computers keep data in a magnetic disc that is unique to them. With the help of special commands, when a need arises, the computers send the needed information in a understandable way through the outer environment unit called monitor after finding the required data.

Information technology is a combination of all technologies that include accumulation, storage and processing of data and the connection of data through cables which makes communication possible for a user. Information technology is a concept used for communication and computer systems connectable to all information services.

It is not possible to sort out information technology with only computers. The major information technologies covering a wider product range are computing and accounting machines used in companies and offices, insulated metal and cable products, electronic gadgets with other electronic parts; the products related with television and radio transmitters, telephone and telegraph line machines, television and radio receiver equipments, sound and video recording devices, photocopy equipments, auxiliary equipment, services related to telecommunication and computer.

The services in particular pertinent to information technologies are the wholesale sale of machinery and equipments and their procurement, the renting of office machines and information technology devices including computers, which can be cited as example of services related to telecommunication and computing.

Information and communication technologies are thought to increase their importance in educational settings in the future. The goal of researchers and educators who want to spread scientific literacy nowadays ought to be the development of new equipment and technologies; therefore, the instruction of information technologies and the integration of it to learning activities. Educators can use information technologies with the whole class, small groups or individuals. The educators can use information technologies for the presentation of knowledge, demonstration of process and skills, explanation of concepts, delivering of instruction, the formation of bonds between concepts and ideas, the demonstration of video with audio, and the exhibition of writings for the entire class (Meadows, 2004). One of the hardest tasks of students and educators is the application of information technologies to other subjects and the integration of it in an ordinary class. In this process, this learning activity possesses the attributes for the adaptation and integration of informatics which can lead the way for educators.

The information and communication technologies, which are claimed to be at the center of the technological advancements related with globalization, are now seen as the indicators of the information society we are in. The technological developments have accelerated the research processes of scientists. While the universities are rendering cost-effective education to students by using information technologies, they have reached higher qualification and flexibility (Tural, 2002).

The main objective of technology education is improving the level of technology literacy of societies to a certain extent, namely, to increase it. Technology education contains the education towards technology which we come across and which finds usage. The science and technology education is forming the basic components the man power that are masters of science and technology and bringing up technology experts for technological advancement and innovation. As such, the education that requires expert knowledge which is higher than the education literacy dimension is in question. In this case, a connection which has scientific dimensions could be mentioned with technological construction and systems which find usage in our daily lives or in different points of life and which can be improved. In education and technology relations, technology has been used to bolster education. This is used for supplying the educated and qualified human resources of the country and it improves general efficiency of education. Furthermore, some new technologies also develop distance education. Thus, meeting old demands and the opportunity of conferring top notch education in case of inadequacy of source of qualified personnel is formed.

EDUCATIONAL TECHNOLOGIES

Although educational technology, which is nourished by computer sciences, systems theory, cognitive sciences, psychology, sociology and some other sciences and which has some unique attributes and which is a multidisciplinary field, it is within the “educational sciences”. In order to define educational technology, many expressions have been put forward by several institutions and organizations and it has been agreed upon in related committees and meetings. The expression above is the last educational technology definition of Association for Educational Communications and Technology (AECT), which is the international organization of educational technology. While educational technology is the name of a discipline, it has been used both as the expression of this discipline around which an application is developed and the name of developers’ profession. In this respect, those individuals who work in the direction of information and principles put forth by the “educational technology” is called educational technologist. All the technologies introduced are called educational technologies.

When we analyze educational technology with its items, we see that it encompasses a large area from theory to application. Many elements stretching from educational psychology to learning and teaching activity are included within the scope of educational technology. The interaction of these elements among each other and their organic connection constitute the technology aggregate. When technology is developed for any educational discipline, the relationship between the estimated targets, for that area, and these elements that form technology with current applications must be taken into account.

While the importance of training and research system that depends on specialization in certain fields still continues in education, it gives its place to interdisciplinary and multidisciplinary research, with a growing trend. We may not yet say that this change is rapid and salient, but we may argue that the change of trends is in this direction. Discipline is the name given to a research area which has a unique educational background, methods and content and which proved that it can produce new information in any field and can develop advanced-level information in aforementioned field (Berger, 1970). Every discipline possesses a distinctive doctrine, a professional language, terminology, and intellectual pioneers and followers (Becher, 1989:22; Parker, 2002:374.).

The main dimensions of knowledge within a discipline is taken on and developed such as historical knowledge, theoretical knowledge, analytical knowledge, practical knowledge, experimental knowledge, empirical knowledge ...etc

The dictionary meaning of the term “interdisciplinary” is the integration or containment of two or more academic disciplines or research areas. Therefore, inter-disciplinary presumes the use of arrangement of a priori information which is structured according to traditional academic disciplines. If you need to make a short definition, inter-disciplinary as a concept means to incorporate and to contain two or more disciplines (Kline,1995; Klein,2000; Cluck,1980)

The concept of information technology is seen as the product of inter-disciplinary education and research environment. Information technology concept opens new opportunities for under-graduate, masters and doctoral level students who wish to pursue their research and development careers in academic or industrial settings. Information technology lessons enrich the multi-disciplinary research environment of students.

The generated large amount of data which is collected with different methods needs the effective transformation of useful information and information accumulation for organizations. An information technology system comes into existence with a series of method and applications that transform data into information and information accumulation in order to support decision making and controlling. These systems besides by safeguarding information can distribute it to related elements inside or outside an organization. The study area of information technology systems is related with analyses and design of these systems. Consequently, an information technology system is a discipline that integrates the technology and management of information systems in a certain field.

So as to ensure that education and learning process is effective, long lasting and more comprehensible, information technologies should be integrated into all lessons and all the individuals from the administrators to students should be enlightened in learning and teaching processes.

The USA, the leading country, and a lot of countries have taken necessary steps in topics related to hardware and network/internet in order to make educational technologies widespread. However, to make the educational systems really effective on student achievement, issues such as quantitative content and teacher training necessitate serious studies. Moreover, applications in the areas of hardware and network connection are almost inadequate and severe inequalities exist among regions in many countries. When we look at these four areas, for instance, related with the agreed targets in the United States, how national educational policies and goals should be determined becomes evident. The existing formulated target in the USA in hardware area is that all the teachers and students should have the latest model of multimedia computers in their classrooms. The objective in network connection is that all the classes should be connected to information highway. The aim in digital content is the supporting students with effective educational software and online resources in educational environments. The goal in professional development is that all teachers should have necessary in service training and support services so that their students can use computer technologies effectively. Whether the identified four goals in these four areas are being met can be measured according to indicators in every area.

Cradler (1996) is recommending some elements that should be kept in mind so as to integrate technology in school curriculum. These items can be summarized as follows: the needs of learners, the availability of resources, the determination of educational needs related to education and technology design and the supplying of technical support and counseling in technology usage for teachers. From the studies done in literature, two chief targets in technology integration can be suggested for the effective usage of technology in schools: One is how technology (for instance computer) will be used and the instruction of how information can be accessed. The other target is the effective usage of information technology (IT) and capabilities (accessing, processing and analyzing of data). According to Melmed (1995), in order to attain these goals, educators should take into consideration the results of the studies done in the area of educational technology and the contextual factors affecting learning targets. Teachers play especially an important role in establishing technology integration in training and education processes. The success of technology integration and students' effective usage of technology at school are contingent upon teachers' behaviors and their wishes for internalizing technology.

University which is one of the important components in societal transformation and its pioneering role in usage of technology in education and development are also significant for societies' adaptation to these technologies and the formation of information society. In order to increase technology utilization in universities, primarily lecturers should be eager to use these technologies in lessons and should reach relevant resources when needed.

On the other hand, the demands and expectations of students in the usage of technologies in the lessons is also an impetus factor for the existence of educational technologies in classrooms.

A study Based on Students' Opinion on the Integration of Information Technology to Lessons in Different Disciplines in Higher Education

METHODOLOGY

Subjects and Processes

There were 210 participants in this study (97 females and 113 males) from different intact student groups from Science and Letters Faculty's, Economical and Administrative Sciences Faculty's, Communication Faculty's, Applied Sciences Higher School's Turkish Language and Literature, Translation and Interpretation, Psychology, Management, Visual Communication Design, Public Relations and Advertising, Radio, Cinema and TV, Journalism and Accounting Information Systems departments. These students were registered for a compulsory discrete IT course. Their ages ranged from 19 to 22 years old. The female students had an average of 1.56 years of computer experience while male had an average of 1.60 years of experience prior to their enrolment in the discrete IT course. The average ages of females and males were 20.65 years old and 21.58 year olds respectively. All these students were predominantly from middle-class income families. The enrolment in the discrete IT course – Computer Technology (Bil 102) – which was introductory in nature, was compulsory for all participants in the survey. This course was facilitated by a male instructor who met with the students for two hours a week for fifteen weeks in a computer laboratory. In addition, the students were also introduced the fundamentals of each IT tool and application via computers.

The laboratory sessions, on the other hand, comprised hands-on instructions and several projects to be completed by the students. The projects consisted of homeworks and hands-on exercises in word processing, presentations, spreadsheets and homepages. Exams and homeworks were graded.

The first set of questionnaires was administered to the students on the first day of the course when the second, third and fourth identical sets were administered on the final day of the course. The passed time between first and others was one semester (15 weeks). The four questionnaires generated a matched pair of data for each student. This was done to determine the effect of exposure on the attitudes towards IT among the student teachers.

Used Items

Four sets of identical questionnaires were developed in the Turkish language. The questionnaire used was adapted from Wong (2002) and it measures the attitudes of participants towards IT. Several items in Wong's (2002) study were adapted from Christensen and Knezek (1998) and Loyld and Gressard (1984). Three dimensions were measured, these being usefulness, confidence and learning.

Wong (2002) and Davis (1989) defined usefulness as the student's beliefs in the enhancement of the quality of their academic or non-academic related work by using a specific system. Confidence and learning were defined as the student teachers' feelings of uncertainty and strong dislike respectively in using the Internet, specific software applications, other general software applications as well as the computer and IT in general for leisure or academic work respectively (Wong, 2002). The questionnaire included 24 items and each item was accompanied by a Likert scale ranging from a score of 1 to 5, with 1 representing "strongly disagree" and 5 representing "strongly agree" for positive items). The questionnaire was validated by an independent course instructor. The questionnaire was pilot tested on a group of students (210) who took the same course a semester before this study was conducted. No ambiguous items were found and the reliability for the 24 items was established at .79 using the Cronbach alpha, indicating good internal consistency. Wong, S. L., & Hanafi, A. (2007).

Data Analysis

A t-test was conducted to determine if there was any significant difference between females and males in terms of their prior computer experience before taking the Bil 102 course. One-way between-group multivariate analysis of variance was performed on the pre- and post- test scores separately to examine if average differences were significant between females and males in terms of usefulness, confidence and learning before and after completing the course. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices and multicollinearity. No serious violations were noted in any of the test scores. Analyses of variances on each dependent variable were conducted as follow-up tests to the Multivariate analysis of variance. Using the Bonferroni method, each analysis of variance was tested at the adjusted alpha level of .004. It is important to note that the alpha levels reported for confidence and learning were cumulative sum of the separate alpha levels for both as these two variables have

reciprocal effects and are, thus not considered mutually exclusive of each other. A paired-sample t-test was conducted and tested at the .04 level to evaluate if there was any significant difference between scores from first to fourth times in respect of the three dependent variables. Wong, S. L., & Hanafi, A. (2007). The analysis was conducted separately for both females and males, to examine if female and male students' attitudes were more positive after completing the Bil 102 course.

Limitations of Study

It should be noted that the ratio of females to males who participated in this study was unequal and the number of participants involved was relatively small (N=210). These factors could pose a threat to the results generated from the Multivariate analysis of variance analysis. Based on the recommendations by Pallant (2001), the number of cases in each cell should be more than the number of dependent variables. The minimum number of cases in each cell for this study was three (the number of dependent variables). In this study, the number of cases per cell far exceeded the minimum number of cases set. Wong, S. L., & Hanafi, A. (2007).

Questionnaire

Within the scope of the lessons of information technology or basic computer technologies, students are given basic information technology concepts, about which the information technology has reached to the point from past to the present, as well as practical education on the standard application software. The most crucial points of this lesson are basic concepts of information technology and computer usage basic training. The commentary of university students related to the scope of this lesson will have a positive effect in the development of this course.

Gender:

Age:

Faculty/Department:

Computer Experience: ...years

The students are required to answer the following survey questions, below, as "I Strongly agree", "I agree", "Neutral", "I do not agree" and "I strongly disagree".

A) The opinions of students on classical education method

1-)The classical plain explanation method in technology lessons is enough for me to understand the subject and system.

2-)Reading a text by looking at the picture in the book to understand the system is not boring and difficult.

3-) I can easily animate the subject in my mind by looking at the picture in the book and reading a text.

4-) I definitely have to repeat myself after the subject is told in so as to understand the system.

5-) It is absolutely necessary for me to comprehend the subject that the teacher first explain it.

6-) If I understand the structure of the subject thoroughly in lesson, I become successful in workshop applications.

B) The opinion of students about constant visual materials

1-) Besides the picture in the book, I can fathom the book completely by the still pictures shown by a projector.

2-) I can grasp the subject with one picture displayed by a projector.

3-) I can understand complex systems easily with a still picture.

4-) It would be better if more than one picture instead of one was shown in order to grasp the system.

5-) I need extra course materials so as to understand the subjects.

6-) I can keep my focus on the subject without getting bored in course environment.

C) The opinions of Students on Computer Assisted Education

1-) There is absolutely a need for computer assisted education-teaching in education

2-) Computer is an ideal equipment for education.

3-) Classical system is sufficient for technology education.

4-) There is no difference between computer assisted- education and that of classical one.

5-) Computer assisted- education can be used as a method to supplement classical system.

6-) I can learn a subject by myself with the help of computer assisted-education, without a teacher's lecture.

D-) The ideas of students on motion picture

1-) I can more easily understand the structure of systems and subjects with moving picture.

2-) Animation is highly effective in the instruction of complex structures.

3-) There is no difference in facilitating understanding between the motion picture and still picture.

4-) I can more easily focus my attention on a subject with the aid of computers and moving pictures.

5-) The topics that seem abstract to me can be more understandable with moving pictures.

6-) Examining change in the system by punching the variables myself is required for my learning.

This research was applied to students of Science and Letters Faculty's, Economical and Administrative Sciences Faculty's, Communication Faculty's, Applied Sciences Higher School's Turkish Language and Literature, Translation and Interpretation, Psychology, Management, Visual Communication Design, Public Relations and Advertising, Radio, Cinema and TV, Journalism and Accounting Information Systems departments of a foundation university (private) in Istanbul

Ten basic expressions are used in this research. These 10 basic expressions were synthesized from the literature on computer usage on education. The sources used are listed at the end of the article.

1. To reach conventional education and training goals during the education program as a tool
2. To widen and enrich education whilst the education program
3. To motivate the learners
4. To support the learners about thinking on their learning.
5. On other conditions, providing those outside the curriculum a chance for an accession.
6. To increase the efficiency in education
7. To lower the education costs
8. To make education more efficient
9. To prepare for work life
10. To decrease the inequality among the students who reach Information and Communication Technologies in different ways.

These expressions reported above are evaluated by students of different faculty and departments of a foundation university. A foundation university is deemed eligible for this study. The newly established foundation universities have been making arrangements and updates in order to take the course curriculum to a degree for their faculties and departments. Especially within the scope of information technologies which is often appropriate to give a common curriculum, computer, information technology etc, from time to time the suitability of courses for students is an issue that should be considered. Based on this idea, a newly founded university, that is, assessment of a university with an unsettled information technology course curriculum will give accurate results.

CONCLUSION

Based on the findings of this study, most of the people answering this survey have agreed to the idea that information and communication technologies are indispensable parts of education. Another derived significant result is that the participants of this survey are of the opinion that the education of information and communication technologies should be bolstered. One other outcome that can be obtained is that the students' computer skills can not be sufficient.

The results drawn from these data put forward the significance of this study. This study will form a serious preliminary study in getting the ideas of people about the usage of Information and Communications in Education in Turkey. The obtained data will be compared with the studies done in other countries and will form the precedent knowledge on the situation of Turkey's ICT and education.

Every university, and even more important than that our whole education system, ought to have a mission and plan about educational technology. Educational technology, which is within systematic approach, for the evaluation of decisions with more objective criteria such as the determination of goals, strategy and solution suggestions, technological applications, integration and the evaluation of results is the necessity of research and continuous scientific reporting.

As a result of this study, the effective and efficient usage of technology as an educational tool can have a noticeable effect on students' achievements, attitudes, communication among teachers and their peers; it can also develop students' interactive, individual learning and high level thinking skills.

Effective technology integration requires radical changes in education and learning system and teachers and the schools that teach them play a key role in this process. Therefore, technology integration devoid of a well-informed, skillful and well-trained teacher will not bring any benefits to education.

In order to meet the related expectations about the utilization of technologies in universities in developed countries and the development of new technologies, the units that just work on this topic have been in operation for a long time. It became obvious that in a variety of researches conducted in our country, in strategic plans of

universities, in order to meet the determined necessities, these departments should be established within Turkish universities and become widespread.

REFERENCES

- Aktan, C.C. (2007) “*Yüksek Öğretimde Değişim: Global Trendler ve Yeni Paradigmalar*”, içinde: C.Can Aktan, Değişim Çağında Yüksek Öğretim, İzmir: Yaşar Üniversitesi Yayını,
- Demiraslan, Y. (2005). *Bilgi ve iletişim teknolojilerinin Öğrenme-Öğretme Sürecine Entegrasyonunun Etkinlik Kuramı'na Göre incelenmesi*, Hacettepe Üniversitesi, Ankara, yayınlanmamış yüksek lisans tezi.
- Ekici, E., Ekici, F. (2011). *Fen Eğitiminde Bilişim Teknolojilerinden Faydalanmanın Yeni ve Etkili Bir Yolu: Yavaş Geçişli Animasyonlar*, *Elementary Education Online*, 10(2), tp: 1-9, 2011. İlköğretim Online, 10(2), ou:1-9,
- Aggarwal, Anil. (2000). *Web-Based Learning and Teaching Technologies: Opportunities and Challenges. Hershey-USA: Idea Group Publishing* Akgül, Mustafa ve Gökçol, Orhan. İnternette ve İlgili Konularda Çokça Sorulan Sorular: INET-TR.css. Sürüm: 02.05.1997, 1997. <http://www.bilkent.edu.tr/turkce/css/inet-tr.html>.
- Aksoy, H. Hüseyin. (2003). *Eğitim Kurumlarında Teknoloji Kullanımı ve Etkilerine İlişkin Bir Çözümleme*. Eğitim Bilim Toplum Dergisi. Cilt:1, Sayı: 4, Ankara: Eğitim Sen, 4–23,
- Alkan, C. (1991). *Bilgisayar destekli öğrenme modülleri*, Ankara, Anı Yay.
- Askar, P. ve Usluel-Koçak, Y. (2003). *Bilgisayarların benimsenme hızına ilişkin boylamsal bir çalışma: Üç okulun karşılaştırılması*. Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 24, 15-25.
- Askar, P. ve Usluel-Koçak, Y. (2005) *Diffusion of computers in schools*. Encyclopedia of Distance Learning Vol:2 (eds. Howard, C. & others). Idea-Group Reference, USA. (published in April 2005)
- Aktepe, B., Öztürk, B., Arı, F., Kubuş, O., Gürbüz, T., Çağıltay, K. (2008) *Öğretim Teknolojileri Destek Ofisleri ve Üniversitedeki Rollerini*. Akademik Bilişim 2008 Çanakkale Onsekiz Mart Üniversitesi, Çanakkale,
- Becker, H. J. (1994). *How exemplary computer-using teachers differ from other teachers: Implications for realizing the potential of computers in schools*. Journal of Research on Computing in Education, 26(3), 291–321.
- Becta (2004). *A Review of the Research Literature on Barriers to the Uptake of ICT by Teachers*. Becta reports. [Online]: Retrieved on May 22, 2007 at URL www.becta.org.uk/page_documents/research/barriers.pdf
- Becher, T. (1989). *Academic Tribes And Territories: Intellectual Enquiry And The Cultures Of Disciplines*. Milton Keynes: SRHE / Open Universit Press.
- Brush, T., Glazewski, K., Rutowski, K., Berg, K., Stromfors, C., Van-Nest, M., et al., (2003). *Integrating technology in a field-based teacher training program: The PT3@ASU Project*. Educational Technology Research and Development, 51(2), 57-72.
- Cartwright, V., Hammond, M. (2003). *The integration and embedding of ICT into the school curriculum: more questions than answers*. Paper presented at the ITTE 2003 Annual Conference of the Association of Information Technology for Teacher Education, Trinity and All Saints College, Leeds.
- Christensen, R. & Knezek, G. (1998). *Teachers' Attitudes Toward Computers Questionnaire*, retrieved May 10, 2007. from <http://www.tcet.unt.edu/pubs/studies/index.htm>.
- Cluck, N. A. (1980). “*Reflections In The Interdisciplinary Approaches To The Humanities*”, Liberal Education, 66.1:67-77.
- Cradler, J. (1996). *Implementing Technology in education: Recent findings from research and evaluation studies*. Retrieved August 15, 2007 from: <http://www.wested.org/techpolicy/refind.html>
- Davis, F. D. (1989). *Perceived usefulness, perceived ease of use and user acceptance of information technology*. MIS Quarterly, 13 (3), 319-339.
- Engeström, Y. (1999). *Activity theory and transformation*. In Engeström, Y., Miettinen, R., Punamaki, R. L. (Ed.). Perspectives on activity theory. (pp.19-38). USA: Cambridge University Press.
- Engeström, Y. and Miettinen, R. (1999). *Activity theory: a well-kept secret*. In Engeström, Y., Miettinen, R., Punamaki, R. L. (Ed). Perspectives on activity theory. (pp.1-16). USA: Cambridge University Press.
- Herzig, R. G. M. (2004), *Technology and its impact in the classroom*. Computers & Education, 42(2), 111-131.
- Klein, J.T. (1990). *Interdisciplinarity: History, Theory and Practice*, Detroit, Wayne State University Press.
- Kline, S.J. (1995). *Conceptual Foundations For Multidisciplinary Thinking*. Stanford: Stanford University Press, 1995.
- Koç, M. (2004) *Öğrenme teorilerinin etkili teknoloji entegrasyonuna ve hizmet öncesi öğretmen eğitimine etkileri: eleştirel literatür taraması*, TürkFen Eğitimi Dergisi, cilt-2 sayı-1
- Loyd, B. H., & Gressard, C. (1984). *Reliability and factorial validity of computer attitude scales*. Educational and Psychology Measurement, 44 (22), 501-505.
- McDermott, L. & Murray, J. (2000). *A study on the effective use and integration of technology into the primary curriculum*. Saint Xavier University, Chicago.

- Meadows, J. (2004) *Science and ICT in the Primary School: a Creative Approach to Big Ideas*. London: David Fulton
- Melmed, A. Ed., (1995). *The Costs and Effectiveness of Educational Technology: Proceedings of a Workshop*. DRU-1205-CTI, Santa Monica: RAND Corporation.
- Çakır, R., Yıldırım, (2009) *Bilgisayar Öğretmenleri Okullardaki Teknoloji Entegrasyonu Hakkında Ne Düşünürler*. Elementary Education Online, 8(3), 952-964,. İlköğretim Online, 8(3), 952-964, 2009.
- Passey, D. (1999). *Strategic evaluation of the impacts on learning of educational technologies: Exploring some of the issues for evaluators and future evaluation audiences*. *Education and Information Technologies*, 4(3), 223-250.
- Parker, J. (2002). *A New Disciplinarity: Communities Of Knowledge, Learning And Practice*. *Teaching in Higher Education* 7.4, 373-386
- Tural, Nejla. (2002). *Küreselleşmenin Üniversite Üzerine Etkileri: Çeşitli Ülkelerden Örnekler*. *Eğitim Araştırmaları*. Sayı: 6, 99-120.
- Watson, D. M. (2001). *Pedagogy before technology: Re-thinking the relationship between ICT and teaching*. *Education and Information Technologies*, 6(4), 251-266.
- Wong S. L. (2002). *Development and validation of an Information Technology based instrument to measure teachers' IT preparedness*, Unpublished doctoral thesis, Universiti Putra Malaysia. Serdang,, Selangor, Malaysia.
- Wong, S. L., & Hanafi, A. (2007). *Gender Differences in Attitudes towards Information Technology among Malaysian Student Teachers: A Case Study at Universiti Putra Malaysia*. *Educational Technology & Society*, 10 (2), 158-169.

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