RESEARCH TRENDS AND ISSUES IN EDUCATIONAL TECHNOLOGY: A CONTENT ANALYSIS OF TOJET (2008–2011)

Müjgan BOZKAYA
Open Education Faculty
Anadolu University
Turkey
mbozkaya@anadolu.edu.tr

İrem ERDEM AYDIN
Open Education Faculty
Anadolu University
Turkey
ieaydin@anadolu.edu.tr

Evrim GENC KUMTEPE
Open Education Faculty
Anadolu University
Turkey
egkumtepe@anadolu.edu.tr

ABSTRACT
This study has been conducted to evaluate the contents of articles published in the Turkish Online Journal of Educational Technology (TOJET) between 2008 and 2011. General aim of the study is to review on what trends, issues and research methods on which studies of educational technology have concentrated in the last four years. Thus, articles which have been published in the last four years have been analyzed in this study under titles of (a) general characteristics of studies; (b) research themes and issues; and (c) research design. A total of 273 articles were reviewed.
Keywords: Educational Technology, Content Analysis

INTRODUCTION

Education and technology are two basic elements that play an important role in rendering individual life effective and efficient. It may be said that conceptual definition of educational technology has evolved from the past to modern day, and this is basically caused by theories, approaches challenging educational technology, technologies used, and paradigm changes in educational technology. Historically, when looking into development of educational technology, it is observed that studies conducted in the field during the era up to 1960s were instrument-oriented. After 1960s, research has been "process-oriented" with the effects of effects of studies related to psychology and learning on teaching practices. Perceiving learning and teaching activities as a process required evaluation of these series of activities utilizing a systematic approach. Consequently with these developments and evolutions, Association for Educational Communication and Technology (AECT) has defined the field as follows: Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources (AECT Definition and Terminology Committee, 2004).

The field has been affected by different theories and it is also reflected in the studies conducted. Under the influence of behaviorist and cognitive theories of 1970s and 1980s, effect of technology used over learning has been frequently questioned (Hannafin & Young, 2008). In this context, studies mostly focused on comparing the effects of computer-based technologies against instructors and traditional textbooks.

The constructivist approach that has become predominant after 1990s argues that learning by an individual is an entirely internal interpretation process and interaction among learners during such process plays an essential role (Ertmer&Newby, 1993). Studies conducted during that era concentrated on strategies technology should employ to convey the information. Also, efforts to explore how information should be structured were influenced by concerns on the environment. Hannafin and Young (2008) stated that the effect of environment on studies conducted during that era was examined within framework of constructivist learning approaches such as collaborative learning, situated learning, and problem solving (pp. 733-734). Field of educational technology, in 2000s and onwards, mostly focused on distance education and web-based applications (Bernard et al., 2004; 2009).

Trends and Issues in Educational Technology

When literature in educational technology field is scrutinized, it is seen that many content analysis studies have been conducted which aim to establish tendencies and problems of the field. Some of the content analyses conducted are reviewed below, first, under the title of Studies on Issues and then, Research Methods according to chronological order.

Studies on Issues in Educational Technology

Klein (1997), in Educational Technology Research and Development (ETR&D) journal, reviewed the 100 articles published between 1989 and 1997 in terms of method used and issues addressed through content analysis method. When articles were reviewed in terms of issues, it was observed that studies generally aimed at investigating instructional design models for computer-based technologies.

Likewise, Masood (2004) examined 200 articles published in ETR&D journal between 1993 and 2002 and attempted to establish trends of issues addressed in educational technology within a decade. He has stated that studies were conducted on issues such as Delivery System/Media Format, Instructional Development, and Instructional Methods. During 2000s, instructional design for distance learning and computer technologies had started to be addressed more. When studies conducted during this era are evaluated in institutional terms, it has been found out that, under the effect of constructivist leaning approaches, issues such as learner-centered, collaborative, and problem-based learning were among the most popular topics.

Ross, Morrison and Lowtherve (2008), with content analysis study conducted for the period of 1994 to 2005 in the ETR&D, established the fundamental issues addressed as macro-instructional strategies such as cooperative learning, problem-based learning, and feedback that affect the design of a course.

With computer and web-based studies getting more and more popular in the field of educational technology in 2000s, number of research conducted on these themes were increased. Shih, Feng, and Tsai (2008) have examined 444 articles of five leading journals in the field of e-learning (Computers and Education, British Journal of Educational Technology, Innovations in Education and Teaching International, Educational Technology Research and Development) published during 2001-2005 by means of content analysis. Their analyses revealed that the most prominent issues were found to be as motivation, data processing, teaching approaches, learning environment, prior knowledge, meta-cognition, and cognitive characteristics in e-learning settings. Issues dealt with in respect of instructional methods were observed as cooperative learning, collaborative learning, situated learning and problem-based learning.

Alper and Gülbahar (2009) carried out a content analysis of 187 articles published in TOJET between 2003 and 2007. They reported that computer- and web-based technologies were the most comprehensively studied themes in the field of educational technology. It was observed that studies generally covered issues on constructivist learning, social learning, diffusion of innovations and cognitive learning. In another study, Alper and Gülbahar (2009) again employed the content analysis method to review 149 articles published from 2005 through 2007 in the five leading journals on educational technology in Turkey. As a result of the analysis carried out, issues addressed mostly concentrated on computer- and web-based applications, as well as open and distance learning studies.

Studies on Research Method in Educational Technology

Klein (1997) analyzed 100 articles published in ETR&D between 1989 and 1997 in terms of methods and found out that the studies were substantially descriptive in nature (49%). In addition, Klein reported that other methods employed in articles were literature review (12%), case study (18%), and empirical research (12%). Hsieh et al. (2005) analyzed studies on educational technology published in four different journals between 1995 and 2004 and extracted that method employed in those studies carried out between these years tended to be qualitative (55%).

Similarly, Ross, Morrison and Lowther (2010) analyzed 43 articles published in ETR&D between 2006 and 2008 in the section of Research and Development in terms of the methods employed in articles. Results indicated that 58% of the studies were identified as descriptive studies. In addition, he reported that 44%, 33%, and 23% of the studies were based on the qualitative, mixed, and quantitative methods, respectively.

Alper and Gülbahar (2009) examined the articles of five educational technology journals in Turkey between 2005 and 2007 regarding research methods and found that the number of qualitative (66) and quantitative (69) based studies were almost equal in data. However, studies utilizing mixed method (12) were fewer in that period. Alper and Gülbahar‘s (2009) another content analysis in TOJET between 2003 and 2007 showed that the

research methods in articles were dominantly literature review and descriptive based studies whereas experimental studies were not very popular. When reviewing articles over the years, within the first three years, studies were mostly structured qualitatively, however, the quantitative design was much more dominant in the last two years.

Based on information given so far, the primary purpose of the current study is to examine which issues were discussed with regards to Educational Technology in TOJET from 2008 and onwards and also which research methods were employed for these inquiries. Therefore, 273 articles published between 2008 and 2011 were reviewed using content analysis technique. Additionally, the results of this research would enable us to compare them with the findings of the previous study conducted by Alper and Gülbahar (2009), thus, we would detect whether research trends and issues in the field of educational technology have undergone any change and improvement in the last four years.

METHODOLOGY

Research Method

This study employs a content analysis of articles published in the Turkish Online Journal of Educational Technology (TOJET) from 2008 through 2011. Content analysis, also known as textual analysis, applies both qualitative and quantitative inquiries to disclose the content of communication that can take many different forms (written, verbal, electronic, etc.). The current study only adopted quantitative content analysis to provide the number of occurrences (frequency) of some concepts and themes within the research articles and to describe current patterns in this context. Content-analytic research process included the following steps: (1) developing coding system (2) extracting articles and implementation of the coding system; (3) classifying coding categories; (4) organizing emergent categories; and (5) interpreting findings.

Data Source

TOJET was selected to conduct this special inquiry since it would be a valuable source to sustain the earlier work done by Alper and Gülbahar (2009) on the same journal and to present current trends, developments, and research strategies in the field. TOJET established in 2002 is known as a scholarly journal for the field focusing on a broad range of research and development issues in the field of educational technology. It is a quarterly, peer-reviewed multidisciplinary electronic journal and abstracted/indexed in many databases including Social Science Citation Index (SSCI), Education Research Index, and ERIC. TOJET has a collection of internationally diverse editorial board members representing the leading scholars in their respective fields. The ultimate aim of TOJET is stated as increasing the depth of the subjects across disciplines and expanding knowledge of educational technology.

As aforementioned, the first content analysis study of TOJET by Alper and Gülbahar in 2009 captured a period of five publication years (2003–2007). The major intend of that study was to examine the characteristics and the general trends of research in the field of educational technology. Within this context, they primarily set certain criteria as variables such as research topics, authors, school level, research theories and design, sample selection technique, and sample size. In parallel with this effort, the current study is designed to address the related concepts as well as to explore new issues and practices of articles published in the last four years of TOJET. It is being inquired whether the findings would be altered over years. In addition, TOJET has been indexed and abstracted in Thomson Reuters SSCI since volume 7, issue 1 in 2008 and the number of articles per issue has been gradually increased since then. It is believed that the findings would be a useful benchmark to assess the past and the current research actions and agendas. From 2008 to 2011 including 16 volumes of TOJET, a total number of 273 articles were selected for this study and all were published in English. Table 1 summarizes the characteristics of the journals and the data source of this present study.

Table 1: Data Source (n=273 articles)

Journal	First Publication Year	No. of Volumes	Publication Frequency (issues/year)	Abstracted/ Indexed in	Publication Volumes & Years included in this study	Number of articles during 2008 – 2011
TOJET	2002	37	2002: 1 2003-2011: 4	24 Databases ie., SSCI, ERI, ERIC	Vol. 1–4: 2008 Vol. 1–4: 2009 Vol. 1–4: 2010 Vol. 1-4: 2011	32 articles 33 articles 79 articles 129articles

Procedure

A coding system was developed to analytically assess and evaluate the articles within the framework of the study. This coding system covers the preset measures falling into three main sections: (a) general characteristics

of studies; (b) research themes and issues; and (c) research design. In the section of general characteristics of studies, there are variables as number of articles per year, number of authors (nature of collaborations), origin of research (country), educational level, target groups, and academic subject area. The realm of research themes and issues addresses the measures as research topics and theories and also instructional mode, and type of media in articles. The last section entitled as research design includes measures on strategies of inquiry, research methods, sample sizes, and data collection methods.

Two authors, specializing in the field of distance education and educational technology and communications, coded the articles. Each researcher coded separately on a subset of articles. Some measures were then classified into emergent themes on the research topics, strategies of inquiry, research methods, and the data collection methods used in these studies. The third author also performed random quality cross-checks to ensure inter-coder reliability in the data. During this process, approximately fifty articles were randomly selected and the third coder reviewed articles in terms of coding accuracy between the panel of two initial coders.

Cohen's Kappa statistics (κ) (1960) were calculated to estimate inter-coder agreement among coders. Kappa values of .21- .40 refer to fair agreement, values of .41-.60 indicate moderate agreement, and values of .61-.80 refer to substantial agreement (Rietveld & van Hout, 1993). Kappa estimates less than .20 indicate low agreement and the estimates more than .80 refer to excellent agreement among coders. Inter-coder agreement scores in this study ranged from .72 to .87, indicating moderate to relatively high agreement for each entry.

RESULTS

I- General Characteristics of Studies

Number of Articles Published

As presented in Table 2, approximately 76 percent of 273 articles were published from 2010 through 2011. There were only 65 articles extracted during 2008–2009 period.

Table 2: Number of Articles Published per Year (n=273)

Year	Frequency	Percent
2008	32	11.7
2009	33	12.1
2010	79	28.9
2011	129	47.3
Total	**273**	**100.0**

The quantity of annually published articles changed significantly with an increasing publication rate after 2009 in TOJET (see Figure 1). This increase in the number of articles within last two years may possibly be a result of growing popularity of TOJET afterward it has been abstracted in a highly selective journal indexing system, SSCI, and therefore there might be a considerable increase in the number of submitted manuscripts to the journal.

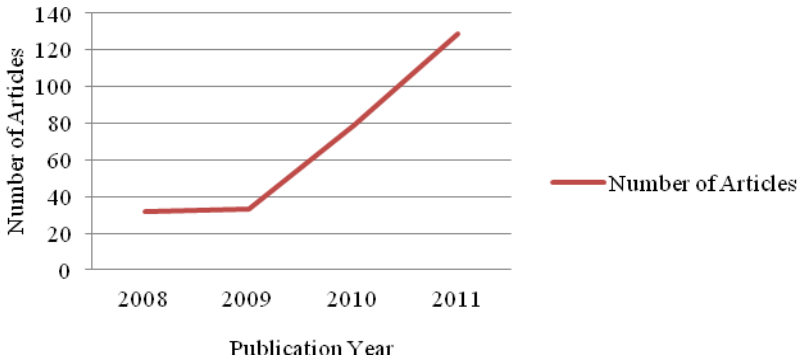

Figure 1: Distribution of Yearly Publication

Nature of Collaboration in Research

As mentioned earlier, educational technology is a multidisciplinary subject and is affected by many theories and practices. Therefore, researchers with different backgrounds and expertise are more and more involved in

collaborative research efforts. In other words, it is anticipated to observe intensive collaborations among researchers year by year. With this regard, the number of authors in articles over four years was examined to detect the nature of collaboration in research studies.

The analyses in Tables 3 and 4 illustrate the total number of single-and multiple-authored articles per year. Considering variations per publication year, both single- and multiple-authored studies gradually increased while the number of articles published increased as well. Meanwhile, the total number of single-authored papers contributed to the 99 (36.3%) studies whereas there were 174 (63.7%) multiple-authored research papers in this four year period.

Table 3: Cross Tabulation of Number of Authors and Year (n=273)

	Year **n (%)**				
Number of Authors	2008	2009	2010	2011	Total
1	13 (40.6)	10 (30.3)	26 (32.9)	50 (38.8)	**99 (36.3)**
2	7 (21.9)	16 (48.5)	26 (32.9)	36 (37.9)	**85 (31.1)**
3	6 (18.8)	4 (12.1)	14 (17.7)	28 (21.7)	**52 (19.0)**
4	3 (9.4)	3 (9.1)	8 (10.1)	9 (7.0)	**23 (8.4)**
5*	3 (9.4)		5 (6.4)	6 (4.7)	**14 (5.0)**
					273 (100.0)

** Indicates number of authors 5 or more*

Table 4: Cross Tabulation of Single vs. Multiple-Authored Articles and Year (n=273)

	Year **n (%)**				
Number of Authors	2008	2009	2010	2011	Total
1	13 (40.6)	10 (30.3)	26 (32.9)	50 (38.8)	**99 (36.3)**
2–5*	19 (59.4)	23 (69.7)	53 (67.1)	79 (61.2)	**174 (63.7)**

** Indicates number of authors 5 or more*

As can be seen from Table 4 and Figure 2, the frequency of multiple-authored articles demonstrates an increasing trend from 2008 through 2011 whereas solo studies did not demonstrate such a consistent positive pattern over years. In other words, collaborative efforts in educational technology research have been increasing for years. However, it should be also noted that single-authored studies have the highest frequency level over years comparing to the number of studies with two, three, four and five and more authors within this period of time (see Table 3).

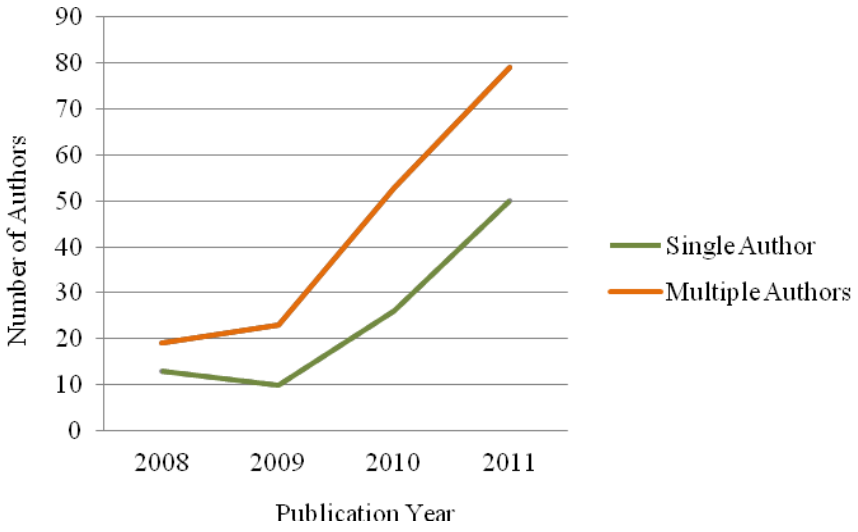

Figure 2: Comparison of single and multiple–authored articles in 2008–2011

Country-wise Distribution of Articles

An analysis of the country-wise distribution of articles revealed that a total of 29 countries were extracted from 2008 through 2011. Of these, 142 (52%) of the 273 studies were carried out in Turkey (Table 5). This could be

the reason of the fact that TOJET is the first-published and a well- known journal in Turkey. The second highest contribution was made by two Asian countries, *Malaysia and Taiwan,* with a total of 52 articles (19.1%).

Table 5: Cross Tabulation of Countries and Publication Years (n=273)

Regions Cluster	Year n (%)				Total
	2008	2009	2010	2011	
Turkey	23 (71.9)	19 (57.6)	40 (50.6)	60 (46.5)	**142 (52.0)**
Malaysia			10 (12.7)	26 (20.2)	**36 (13.2)**
Taiwan		1 (3.0)	9 (11.4)	6 (4.7)	**16 (5.9)**
Turkish Republic of Northern Cyprus		3 (9.1)	2 (2.5)	6 (4.7)	**11 (4.0)**
USA	2 (6.3)	2 (6.1)	3 (3.8)	4 (3.1)	**11 (4.0)**
Others*	7 (21.9)	8 (24.2)	15 (19.0)	27 (20.9)	**57 (20.9)**
Total	**32 (100)**	**33 (100)**	**79 (100)**	**129 (100)**	**273 (100)**

**Capturing Canada, China, Czech Republic, Ghana, Greece, Hungary, Iran, Iraq, Jordan, Korea, Nigeria, Norway, Pakistan, Poland, Portugal, Saudi Arabia, Serbia, Singapore, Slovenia, Sweden, South Korea, Thailand, and UK.*

The total number of publications from Turkish Republic of Northern Cyprus and USA's scholars was identical as 11 studies during this period. The number of publications from other 23 countries was found to be 57 of 273 articles. Overall, the contributions from each country have been more diversified and inflated in size over years.

Educational Level and Target Population

Multi level cross tabulation analysis of educational level and target population per year resulted that higher education as an educational level (n=165 articles) and students as a target group (n=215 articles) have been more commonly studied than other target groups from 2008 to 2011 (Table 6 and Figure 3). Following this group of participants, educators (teachers, instructors, tutors, etc.) is the second most studied target group (n=30 articles) including all educational levels. Other types of participants were not as much researched (n=12) throughout these years.

Table 6: *Articles* Classified by School Levels and Target Group per Year

Educational Level	Target Group	Year n				**Total**	**Grand Total**
		2008	2009	2010	2011		
K-12	Principal & Administrators	1		1		**2**	**85**
	Teachers	3		10	3	**16**	
	Students	5	7	19	35	**66**	
	Parents				1	**1**	
Higher Education	Instructors	6	2	4	2	**14**	**165**
	Students	14	20	43	72	**149**	
	Other Staff (Courseware developers, technical staff)	1			1	2	
Others*		3	1		3	**7**	**7**

** Target groups including adults, firms, engineers, technicians, employers, and articles*

Note: Some articles include more than one target group

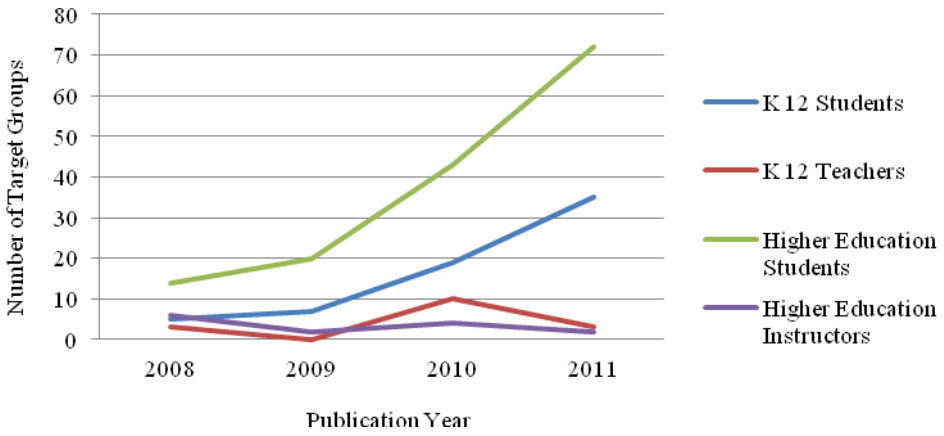

Figure 3: Distribution of educational levels by target groups

These results indicate a positive tendency towards engaging college level research activities in the field of educational technology since technology integration is really a new initiatives for lower levels comparing to common applications in higher education.

Academic Subject Taught

For the analysis of the academic subjects in articles, each subject area was extracted and then grouped in five general domains as social sciences, language, mathematics, science and engineering, and finally physical education. Herein, it should be noted that some studies addressed more than one subject area. Table 7 shows that most of the studies (n=128) were related to the area of social sciences.

Table 7: Cross tabulation of Academic Subject Area

Subject Area	Year n				Total
	2008	2009	2010	2011	
Social Sciences[1]	18	16	12	82	**128**
Language	3	4	8	8	**23**
Mathematics	3	2	8	9	**22**
Science & Engineering[2]	9	8	16	30	**63**
Physical Education	1	2		7	**10**
Total	**34**	**32**	**44**	**136**	

[1] *Including education, distance education, literature, theology, music education, and early childhood education*
[2] *Including biology, chemistry, physics, computer science, biostatistics, and architecture*
Note: Some articles addressed more than one subject area

The next popular topic studied in the field of educational technology was found to be science and engineering (n=63). Studies in the language arts and mathematics were almost equally studied (n=23; n=22, respectively). Physical education was the subject of 10 studies from 2008 through 2011 in TOJET. Although research in social sciences was most popular between 2008 and 2009, science and engineering areas have been more popular subjects since then.

II- Research Themes and Issues

Research Topics

The research topics extracted from 273 studies in TOJET from 2008 to 2011 were coded and then classified into five major research themes. Each theme is described as below:

1. *Media Study* –Media comparison studies such as face-to-face versus other types of media were placed under this theme. Specifically, media comparison studies on the effects of teaching-learning process, learning characteristics and specific measurements (learners and instructors' attitudes toward media being used, achievement, technology perceptions, familiarity, self efficacy, satisfaction, motivation, perceptions of social existence, gender and age differences, learning styles , interaction levels, frequency of use of technology) were included in this theme.

2. *Design & Development* – This theme covers studies on instructional design, software development efforts or modeling technology to enhance the effectiveness and efficiency of the process of learning and teaching.
3. *Evaluation* – This theme include evaluation-based studies on teaching and learning process (peer evaluation, evaluation of technological trends, evaluations of standards/policies regarding use of technology, evaluation of distance learning environments, assessment of employees' skills regarding technology, evaluation of software).
4. *Teaching & Learning Approaches* – This theme capture studies focusing on different theories and approaches used in teaching-learning process (constructive learning, cooperative learning, problem based learning, blended learning, distributed learning, project-based learning, media richness, social networking).
5. *Others* – This theme covers studies that cannot be included in any of the above topics. For example, the effects of technology on human health, the ethical issues arising in the use of ICT.

The analysis of cross tabulation of research themes and publication years between 2008 and 2011 shows that 156 studies were focused on media related studies. Research themes of *Design and Development* (n=54), *Teaching and Learning Approaches* (n=52), and Evaluation (n=49) were almost equally studied. Only three studies did not fit to any available research themes during this period (Table 8).

Table 8: Cross Tabulation of Research Themes and Publication Year

Research Themes	Year n				Total
	2008	2009	2010	2011	
Media Study	22	16	53	65	**156**
Design & Development	5	6	8	35	**54**
Evaluation	7	5	14	23	**49**
Teaching & Learning Approaches	7	12	12	21	**52**
Others		1	1	1	**3**

Note: Some studies could focus on more than one issue

There are noticeable positive trends of research agendas on Media Study, Design and Development and also Evaluation in articles for the period of 2008–2011. However, the theme of Teaching and Learning Approaches demonstrates consistent trend between 2008 and 2010.

Research Theories

Within four years period of data, research theories in articles were identified and then classified into four domains as Learning Theories, Psychological Theories, Sociological Theories, and Communication & Media Theories. Table 9 portrays the number of frequency of each theory in the articles reviewed. The results noticeably reflected that the large proportion of learning theories (n=49) was dominant comparing to other three types of theories in the articles covered. Following this, psychological and sociological theories were implemented in studies during this term. However, it should be noted that all of these contribute to the field and cannot easily be separated from each other.

Table 9: Research Theories

Learning Theories	Number of Articles
Constructivist Theory	14
Social Learning Theory	13
Collaborative Learning Theory	7
Generative Learning Theory	6
Blended Learning Theory	2
Problem Based Learning Theory	2
Multiple Intelligence Theory	1
Distributed Learning Theory	1
Critical Thinking Theory	1
Engagement Theory	1
Cognitive Load Theory	1
Psychological Theories	
Flow Theory	2
Motivation Theory	5
Sociological Theories	

Social Network Theory	3
Digital Divide	1
Social Agency Theory	1
Communication & Media Theories	
Social Presence Theory	1
Media Richness Theory	1
Diffusion of Innovations Theory	1

Note: Some articles could be used more than one approach.

Instructional Mode

Articles were also classified based on instructional mode they utilized as traditional (face-to-face; F2F), distance and combined strategy (Table 10). Studies coded under combined strategy were also differentiated as F2F with Distance mode and F2F versus Distance mode. Considering this classification, from 2008 through 2011, traditional mode were implemented or studied in134 articles while 76 studies worked related to distance mode of instruction. 13 out of 233 studies enhanced face-to-face mode of instruction with distance learning strategies. Only 10 studies used comparison technique to examine differences between face-to-face mode of instruction and distance learning environment.

Table 10: *Articles Classified by Instructional Mode (n=233)*

Instructional Mode	Year n				Total
	2008	2009	2010	2011	
Traditional Mode (Face-to-Face – F2F)	18	18	34	64	**134**
Distance Mode	5	6	26	39	**76**
Combined Strategy					
F2F **with Distance mode**	3	1	5	4	**13**
F2F **vs. Distance mode***	2	1	2	5	**10**
Total	**28**	**26**	**67**	**112**	**233**

** Comparison type studies*

Type of Media

Major types of media as a means of communicating information in articles were categorized as computer-based instruction, web-based instruction, video & visual media, web 2.0 tools, instructional TV, and mobile tools. These media were also examined considering instructional mode that was studied in articles. As can be seen, the most popular media in face-to-face mode was computer-based instruction (n=68) whereas web-based instruction was the most implemented type of media in distance learning mode in the articles (n=63) (see Table 11). The category of web 2.0 tools and mobile tools was equally incorporated in both F2F and distance environments. However, video & visual media was not as frequently studied in distance learning environments. Instructional TV was the most neglected form of communication during 2008–2011.

Table 11: Cross Tabulation of Type of Media and Year by Instructional Mode

Instructional Mode	Media	Year n				**Total**	**Grand Total**
		2008	2009	2010	2011		
Traditional	Computer-Based Instruction	6	8	20	34	**68**	**117**
	Web-Based Instruction	5	3	7	16	**31**	
	Video & Visual Media		2	2	3	**7**	
	Web 2.0 tools*	1	1	2	4	**8**	
	Instructional TV		1			**1**	
	Mobile Tools**		1		1	**2**	
Distance	Computer-Based Instruction				3	**3**	**76**
	Web-Based Instruction	4	5	25	29	**63**	
	Video & Visual Media	1			1	**2**	
	Web 2.0				4	**4**	
	Instructional TV		1		1	**2**	
	Mobile Tools			1	1	**2**	
Combined Strategy	Computer-Based Instruction	3		1	4	**8**	
	Web-Based Instruction	2	2	6	3	**13**	

Video & Visual Media	1			**1**	**23**
Mobile Tools			1	**1**	

**Blogs, wiki, second life*
***Mobile tools included PDA, mobile phones, etc.*
Note: One study could include more than one type of media and 17 studies using traditional mode did not mention what type of media was employed.

III- Research Design

Research Methods

Three main research methods were coded in articles as *Quantitative, Qualitative,* and *Mixed Method* approaches. Findings tabulated in Table 12 point out that almost 62% of 273 articles used a quantitative research method (n=169) whereas qualitative (17.2%) and mixed method (14.3%) approaches were almost equally preferred research approaches in articles during the period. On the other hand, no specific research method was stated in 18 (6.6%) out of 273 articles. These articles were mainly identified as literature reviews and program introduction papers.

Table 12: Cross Tabulation of Research Methods and Years (n=273)

Method	Year n				Total n (%)
	2008	2009	2010	2011	
Quantitative	23	19	48	79	**169 (61.9)**
Qualitative	7	7	14	19	**47 (17.2)**
Mixed	1	4	12	22	**39 (14.3)**
Not Specified*	1	3	5	9	**18 (6.6)**
Total	**32**	**33**	**79**	**129**	**273 (100)**

** Including review-based and program introduction articles*

Even though the frequency of studies employed quantitative approach seems to have considerably been increased during 2009–2011, mixed method and qualitative methodologies have been getting more popular in research in last two years of data.

Strategies of Inquiry

Analysis of research strategies used in articles indicated that 173 articles employed quantitative descriptive-type inquiry (see Table 13). The next trendy strategy in research was found to be exploratory case study (n=43) between 2008 and 2011 followed by all types of experimental studies which were used in a total of 31 articles. Within this period only one study used a meta-analytic approach published in 2011. Results also indicated that researchers showed much more tendency towards exploratory case studies in recent years. However, descriptive strategies including survey methods seem to be a dominant technique throughout these years.

Table 13: Cross Tabulation of Strategies of Inquiry and Years

Research Strategy	Year n				Total
	2008	2009	2010	2011	
Experimental	4	1	4	12	**21**
Quasi-Experimental			4	6	**10**
Descriptive	19	21	50	83	**173**
Other Quantitative Strategies[1]				2	**2**
Exploratory Case Study	4	6	14	19	**43**
Other Qualitative Strategies[2]	2	2	1	6	**11**
Mixed Method Strategies[3]	2	3	5	9	**19**
Literature Review		2	2	5	**9**
Others*	1	2	4	4	**11**

[1] Meta-analysis, social network analysis
2 Phenomenology, grounded theory, action research, discourse analysis
3 Sequential methods, content analysis, Delphi
** Including theoretical inquiry, program introduction, system modeling articles*

Data Collection Methods

According to data collection methods used in articles, seven main data collection techniques were tabulated during the years under investigation. There is a clear indication that researchers employed multiple data

collection methods to validate findings. Researchers in the field frequently used, in order, surveys/questionnaires (n=128), interviews (n=57), scales (n=51), documents (n=50), achievement tests (n=49), and observations (n=25). However, field notes were used in only six studies during this term (Table 14).

Table 14: Cross Tabulation of Data Collection Methods and Years

Data Collection Method	Year n				Total
	2008	2009	2010	2011	
Survey / Questionnaire	12	15	44	57	**128**
Scale	9	10	3	29	**51**
Interview[1]	3	8	18	28	**57**
Observation	4	1	3	17	**25**
Field Notes	1	1		4	**6**
Achievement Test	6	7	5	31	**49**
Documents[2]	5	10	17	18	**50**

[1]*Including one-to-one and focus group interviews*
[2]*Including articles, emails, written artifacts, assignments, journals/diary, portfolio, audio/video files, essays*
Note: One study could use more than one type of data collection techniques

Sample Size

Sample sizes collected by each study were determined and coded based on the range groups in Table 14. Researchers in the field frequently collected data from large samples (>200 cases; n=71) to establish generalizable data. As a matter of fact, it is an expected finding since most studies utilized quantitative methodology and survey research. On the other hand, researchers collected data from less than 60 units as samples in almost 40% of the articles.

Table 15: Cross Tabulation of Range of Sample Sizes and Years (n=235)

Range of samples	Year n				Total n(%)
	2008	2009	2010	2011	
1 – 29	4	4	11	21	**40(17.0)**
30 – 59	6	6	17	20	**49 (20.9)**
60 – 89	2	5	5	11	**23(9.8)**
90 – 119	4	1	4	7	**16(6.8)**
120 – 159	1	5	4	11	**21(8.9)**
160 – 200	1	4	2	8	**15(6.4)**
200 >	4	3	27	37	**71(30.2)**
Total	22	28	70	115	**235**

Small samples (n <30) were also detected in the 40 articles and is recognized that they were the subjects in qualitative-driven studies between 2008 and 2011 in TOJET. The next section will discuss the finding within the context and the results of the previous studies.

DISCUSSION AND CONCLUSION

Considering historical development process of the educational technology, we witness that it has a dynamic structure that evolves and develops depending on the requirements of the current era. This structure fundamentally seems to have been influenced by theories, approaches, technologies and paradigm shifts which shape the field of educational technology. Review-based studies in the field indicated that indeed, research themes and methods in studies are affected by aforementioned changes. In this context, this study aims to find out how these changes in the educational technology field were reflected upon 273 studies published in 16 volumes of TOJET in the last four years (2008-2011). Findings in the current study were discussed under the following sections; (a) general characteristics of studies; (b) research themes and issues; and (c) research design.

General Characteristics of Studies

Articles within this period of time appear to have either single- or two-authored based studies. Although this may be attributed to various reasons, the most important reason is that the Council of Higher Education in Turkey stipulates it as a prerequisite for academic promotions and appointments to have a single author-based -studies in academic studies both in social sciences and other scientific fields. Besides, preferring individual studies may also be considered as a cultural phenomenon of Turkish educational system. Some of the factors that create such an individualistic culture might be the dominance of individual-based measurement and assessment models in

the Turkish education system which lasts until the higher education and the lack of focus on collaborative working skills. This is confirmed by the content analysis of Alper and Gülbahar (2009) on articles published in TOJET between 2002 and 2007. In contrast, when content analyses on similar studies in renowned international journals of educational technology are examined, there is generally a tendency towards co-authored teamwork studies (Genç Kumtepe, Bozkaya & Erdem Aydın, 2012).

It was found out that studies published in TOJET between 2008 and 2011 were conducted in 28 different countries. It was concluded that 142 of 273 articles (52%) studies conducted in Turkey. Some of the most significant reasons of this conclusion might be the fact that the journal was originated in Turkey and is the one of leading journal in the international context of educational technology. On the other side, another factor that reduces diversity of country wise distribution of articles might be the fact that researchers in other countries were familiar with other leading international journals that they were familiar before TOJET being indexed in SSCI. However, this conclusion does not seem irrelevant when we take into account the allocated space for regional studies in many international journals.

The analyses of the educational level and target audience of the studies revealed that the studies predominantly focused on higher education (165) as the major target audience. This finding again overlaps with the results of Alper and Gülbahar's (2009) study where the variable of educational level was coded as school level. The reason why technology-based practices can be employed in the learning-teaching process much easily at the higher education level might possibly be the fact that particularly those who conduct academic studies are not much exposed to bureaucratic obstacles, or do not experience administrative problems related to the target audience.

Research Themes and Issues

Regarding research issues and themes in the period of 2008 – 2011, it was observed that studies published in TOJET in social sciences (i.e., education, distance education, theology, literature, music education) were greater in number (n=128) compared to the studies in other fields. Particularly, studies in social sciences published in 2011 were predominant compared with previous years and other fields, as well. However, it was seen that studies conducted in the field of natural sciences such as biology, chemistry, biostatistics, architecture, and computer sciences increased in number in comparison to previous years during 2011. The fact that studies in natural sciences increased in amount after 2010 might be attributed, particularly, to the innovations and development in computer technologies. The use and the integration of technology in 2000s becoming popular issues of scientific research in natural sciences might be listed among the reasons of such developments (Genç Kumtepe et al., 2010).

The analysis of articles based on research themes yielded a result that studies on *media comparison* were seen to be a popular research topic (n=156) in this period. In those studies, the effects of media on learning-teaching process and also the relationships between media and some learner related constructs (e.g. attitudes, perceptions) were evaluated. On the other hand, studies under the heading of *design and development*[1] seemed to have picked up pace in 2011. The intensive use of technology-based applications in the learning-teaching processes accelerated design and development studies as to how the technology used can best be structured in the most effective, efficient and attractive manner (Klein,1997; Masood, 2004).

The instructional mode discussed in the studies was reviewed as traditional, distance, and combined strategy. The traditional mode was found to be the most preferred instructional mode in the field of educational technology in these years. However, the interesting point, herein, is that distance learning appeared to be an instructional mode widely used in educational technology particularly in 2010 and onwards. Some of the most important reasons of this finding are the increased interest for distance learning in almost all colleges, driven by various requirements, and the organization of distance learning centers in response to such interest. On the other hand, computer- and web-based applications appear to be used intensively in all three of the instructional modes. This finding also overlaps the finding of Masood's (2004) study on the determination of trends in the educational technology which claimed that there is a research tendency towards distance learning and web-based learning in studies.

The widespread use of computer- and web-based applications in learning and teaching environment not only facilitates social learning by individuals but also enables collaborative research efforts. In other words, learning-teaching media becoming increasingly web-based brings up constructivist learning approaches to the agenda

[1] Studies included efforts for developing a new instructional design, software or model with an aim to increase effectiveness and efficiency of the learning-teaching process

rather than behaviorist ones (Jonassen & Lund, 2000). At this point, it may be argued as well that use of technology was an effective medium and tool in the progress of the constructivist approach.

According to reviews of previous content analyses in the field (Alper & Gülbahar, 2009; Masood, 2004; Rosset al., 2008; Shih et al., 2008), it was found that collaborative learning, problem-based learning, and social learning based applications became prominent issues with the influence of the constructivist learning approaches. The current study confirms that the effects of constructivist shift that emerged in the 1990s still endure in 2011. Similarly, in line with the increase in the use of web-based applications in learning-teaching processes, it is worth mentioning that applications based on social learning and collaborative efforts have gained momentum along with constructivism. However, when examining the articles in terms of theoretical foundations, it was found that a great majority of them fail to build a theoretical framework. Such finding also mentioned in the study of Alper and Gülbahar (2009) and it was emphasized that as one of the issues that must be addressed in further studies.

Research Design

When studies published in the last four years of TOJET were reviewed in the context of research strategies, it appeared that quantitative methodology has been used predominantly (n=169). However, in the research conducted in the last two years, there is a tendency to use qualitative and mixed methods besides quantitative methods. Such conclusion suggests that researchers endeavored in their studies to identify the causes of the relationship between variables, rather than describing existing cases. These studies captures qualitative and mixed method research papers, wherein, rather than comparing media, the effects of different elements of the media on different cognitive processes are studied. These studies were also discussed on the issues including determination of opinions and expectations of learners, and social dimensions of learning. This finding is also consistent with the results of Hsieh et al. (2005)' study indicating that qualitative studies became popular in the educational technology field after the 2000s.

The results of analyses on strategies of inquiry in articles during this term, it was observed that most of the researchers preferred to conduct quantitative based descriptive studies (n=173). According to the content analysis study conducted by Alper and Gülbahar (2009) for the period between 2003 and 2007, it was seen that, as a research strategy, researchers often preferred descriptive studies and literature reviews over other methods. On the other hand, Alper and Gülbahar (2009) stated that studies involving literature reviews were the most frequently used method during such period. However, in this study which reviews the last four years, literature review appears to be the least frequently used research method in the studies (n=9). This finding indicated that researchers showed much more tendency towards empirical studies in recent years.

Regarding data collection techniques, it was found that researchers often used Surveys/Questionnaires as data collection tools in studies published between 2008 and 2011 in TOJET. Unlike this finding, in the study of Alper and Gülbahar (2009), it seems that scale was the major data collection tool of the studies rather than surveys.
Both in the current study and the study by Alper and Gülbahar (2009) indicated that authors generally worked with large samples for their studies. Working with large samples ensures generalizable of findings and consequently, it is an evidence of an attempt to establish external validity of data.

IMPLICATIONS

Regarding results of the current study, the following implications should be considered:

- Downsizing the focus on single-authored articles that are seen as a prerequisite for academic promotion and appointment by the Council of Higher Education, and encouraging co-authored and even multi-disciplinary studies.
- Keeping abreast of developments and innovations in educational technology in social sciences as well as in natural sciences such as physical sciences, mathematics, engineering, and architecture.
- Increasing examples of innovations and developments in educational technology within interdisciplinary and intercultural studies.
- Eliminating the bureaucratic and administrative obstacles for conducting studies with samples from other levels of education, namely kindergarten through secondary education, as most of the studies in the field have focused on learners in higher education.
- In addition to quantitative descriptive approaches, offering room for qualitative and mixed research methods which investigate a situation that emerges during a study, taking account the causality relationships and the circumstances under which such situation emerged.
- Conducting analytic and modeling research aimed at practice, carrying descriptive studies a step further.
- Promoting research focusing on macro analysis rather than micro analysis.
- Endorsing research efforts in diverse areas like cognitive psychology and social learning theory.

- Deviating from media comparison studies, and conducting analytic studies which will reveal the effects of media characteristics on cognition.

REFERENCES

Association for Educational Communications and Technology (2004). Definition. In A. Januszewski and M. Molenda (Eds.), *Educational Technology: A definition with commentary.* New York: Lawrence Erlbaum Associates.

Alper, A., & Gülbahar Y. (2009). Trends and issues in educational technologies: A review of recent research in TOJET. *The Turkish Online Journal of Educational Technology (TOJET), 8* (2), 12.

Alper, A., & Gülbahar Y. (2009).Öğretim teknolojileri alanında yapılan araştırmalar konusunda bir içerik analizi. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi, 42* (2), 93-111.

Bernard, R. M., Abrami, P. C., Borokhovski, C., Wade, C. A., Tamin, R. M., Surkes, M. A., & Bethel, E. C. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational Research*, *79*(3), 1243–1289.

Bernard, R. M., Abrami, P. C., Lou, Y., Borokhovski, E., Wade, C. A., Wozney, L., Wallet,P. W., Fiset, M., & Huang, B. (2004). How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. *Review of Educational Research, 74,* 379–439.

Ertmer, P.A. & Newby, T.J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 6* (4), 50–72.

Genc Kumtepe, E., Bozkaya, M., & Erdem Aydın, İ.(2012). Where are we heading to? Review of distance science education research (2000-2010): A content-analytic approach. In L. Lennex & K. Nettleton (Eds.), *Cases on inquiry through instructional technology in math and science: Systemic approaches*, (pp. 99–137) New York, NY: IGI.

Hannafin, R. D., & Young, M. (2008). Research on educational technologies. In M. Spector, M. D. Merrill, J. V. Merrienboer, & M. Driscoll (Eds.). *Handbook of research on educational communications and technology,* (3rd Edition) (pp. 731–739). New York: Routledge.

Hsieh, P., Acee, T., Chung, W., Hsieh, Y., Kim, H., Thomas, G., Levin, J. R., & Robinson, D. H. (2005). Is educational intervention research on the decline? *Journal of Educational Psychology, 97*(4), 523–529.

Jonassen, D.H. & Land, S.M. (Eds.) (2000). *Theoretical foundations of learning environments*. Mahwah,NJ: Lawrence Erlbaum Associates.

Klein, D. J. (1997). ETR&D– Development: An analysis of content and survey of future direction. *Educational Technology Research and Development (ETR&D), 45*(3), 57–62.

Masood, M. (2004). A ten year analysis: Trends in traditional educational technology literature. *Malaysian Online Journal of Instructional Technology (MOJIT), 1(2)*, 73–91.

Rietveld, T. & Van Hout, R. (1993). *Statistical techniques for the study of language and language behaviour*. Berlin, New York: Mouton de Gruyter.

Ross, S. M., Morrison, G. R. Lowther, D. L. (2010). Educational technology research past and present: Balancing rigor and relevance to impact school learning. *Contemporary Educational Technology, 1*(1), 17–15.

Ross, S. M., & Morrison, G. R. (2008). Research on instructional strategies. In M. Spector, M. D. Merrill, J. V. Merrienboer, & M. Driscoll (Eds.). *Handbook of research on educational communications and technology*, (3rd Edition) (pp. 719–730). New York: Routledge.

Shih, M., Feng, J. & Tsai, C. (2008). Research and trends in the field of elearning from 2001 to 2005: A content analysis of cognitive studies in selected journals. *Computers and Education, 51*, 955–967.

Seels, B.B. & Richey, R.C. (1994). *Instructional technology: The definition and domains of the field.* Washington, DC: Association for Educational Communications and Technology.

