Id: 1171922

Participatory Educational Research (PER)
Vol.10(1), pp. 140-159, January 2023
Available online at http://www.perjournal.com
ISSN: 2148-6123
http://dx.doi.org/10.17275/per.23.8.10.1

Educational Technology Research Trends: A 10-Year Content Analysis of PhD Dissertations

Ali GÜNDÜZ *
Department of Computer Education & Instructional Technology, Ataturk University, Erzurum, Turkey
ORCID: 0000-0002-8906-2317

Cengiz GÜNDÜZALP
Department of Computer Technologies, Kafkas University, Kars, Turkey
ORCID ID: 0000-0001-5108-437X

Ömer KOÇAK
Department of Information & Document Management, Ataturk University, Erzurum, Turkey
ORCID ID: 0000-0001-7756-7169

Yüksel GÖKTAŞ
Department of Software Engineering, Ataturk University, Erzurum, Turkey
ORCID ID: 0000-0002-7341-2466

Article history
Received:
06.07.2022

Received in revised form:
29.09.2022

Accepted:
22.11.2022

Key words:
educational technologies, statistical trends, methodological trends, keyword analysis

This study investigates the trends of doctoral dissertations produced in Türkiye in the field of Educational Technologies. 292 doctoral dissertations were included in this study which was conducted in the design of document analysis in the period between 2011 and 2020. The dissertations were put to content analysis by using the Dissertation Analysis Form developed within the scope of this study. The results demonstrated that the approach of the mixed method research was more commonly used in the dissertations. As a research model, it has been determined that case study from qualitative approaches and quasi-experimental model from quantitative approaches are mostly preferred. It is seen that the students of the faculty of education are greatly used as the sample. It is concluded that descriptive statistical methods are mostly used during the data analysis phase and the SPSS program is the most frequently preferred data analysis program. It has been determined that simple level statistical analysis techniques are used in theses. It is clear that although effect size calculations were made, there were also studies in which the type was not specified. Of the statistical techniques used for validity and reliability, Cronbach's Alpha internal consistency coefficient was found to be frequently used. 1376 keywords emerged in the analysed theses. These keywords were presented visually using a

* Correspondency: ali_gunduz@hotmail.com

	force-directed algorithm. Stating sampling methods clearly in studies will guide the studies to be conducted in the future. The sampling of different types of students is important in that it enriches the potential areas of study paving the way for the emergence of different perspectives.

Introduction

Educational Technologies (ET), is a field with influences from a wide variety of disciplinary sources which change in parallel to the rapid changes and developments in technology, offer new possibilities to the learning and teaching processes. So, the field has adopted new teaching theories/methods by controlling the teaching process to improve students' learning experiences by new scientific and technological perspectives (Scanlon, 2021). In addition to making contributions to the development of learning and teaching processes, ET has also caused an increase in the number of studies in the field (Hsu et al., 2013). Especially after the year 2000, a rapid increase occurred in the number of studies conducted in ET and the number of researcher discourse has increased from 2011 to 2018, representing a 300% increase over the period (Dubé & Wen, 2021; Yoo & Kim 2018). Additionally, the field of ET, which tried to find a place for itself in the field of educational research with very few private journals in the 1980s, has turned into an important sub-field of education, especially in the last 40 years, thanks to technological developments and academic studies and today it constitutes a large sub-field of social sciences with a few dozen journals (Lai and Bower, 2020). As a result of this increase, the research subjects, areas of study and the methods used in the ET studies were diversified. So, it is important to know how studies on ET studies are carried out (Yildiz et al., 2020) and several studies were frequently conducted to determine the research trends in the field.

Alkraiji and Eidaroos (2016) examined 52 studies published in various journals in terms of "types of technology", "the socio-technical research context", "research theories and the research paradigm" and "methodology" variables. As a result of this study, they stated that LMS Blackboard research came to the fore the most, and smart devices social network systems were less studied subjects. Natividad et al., (2018) stated that *"learning and Instruction*", "*educational theories and technology*", "*web-based learning*", "*Teacher Preparation and Professional Development*" are most popular subjects. On the other hand, Krull and Duart (2017) state that approaches of qualitative research are preferred more. Li et al., (2019) analyzed the articles between 1996 and 2016 with bibliometric analysis in order to reveal the general trend in multimedia learning research. As a result of the analysis, they stated that the keyword "*cognitive load*" came to the fore and the keyword "*animation*" was most related to other keywords. Chen et al., (2019) analyzed 3963 articles published in the last 40 years with the bibliometric analysis method to determine the trend in the field of ET. They stated that the keywords "Interactive learning environment" and "Teaching/learning strategies" are among the most used keywords both in 10-year periods and in the last 40 years. Analyzing 50 years of articles published in the British Journal of Education (BJET) with the bibliometric method, Chen et al. (2020a) stated that the keywords "*case study*", "*communication technology learning*" and "*learning process*" were used the most between 1992 and 2018, respectively. They also stated that the focus of "*classroom pedagogy with the use of technologies*" is more intense studied subject within BJET. Dubé & Wen, (2021), on the other hand, revealed the trend change in the field of ET at the K-12 level in the last 10 years. When the results of the research

were examined, they stated that mobile technologies were a consistent trend between the specified years, and there was a trend towards maker technologies and games at the beginning of the decade. Hwang and Chen (2022) stated that the most prominent keywords in their trend research using the bibliometric analysis method are "interactive learning environments", "game-based learning" and "teaching/learning strategies". When the studies in the field of ET are examined, it is seen that mostly methodological or research trends are revealed, but statistical trends are not analyzed.

On the other hand, various studies were conducted to analyse the statistical trends and to reveal the statistical techniques in social sciences literature (Bangert & Baumberger 2005; Quarterman et al., 2005). Skidmore and Thompson (2010), who investigated the most frequently used statistical techniques in education and psychology, compiled studies analysing the statistical technique trends. Accordingly, while it was stated that the use of T-test, Anova/Ancova tests decreased; it was stated that the use of factor analysis, cluster analysis and regression increased. Bangert and Baumberger (2005), in a study where they compiled the statistical techniques used in a journal, stated that mostly basic techniques were used. The study also found that mostly the research designs which did not require interventions were used. In the meta-analysis study conducted by Rahmati et al., (2021), they stated that while t-test, corelation, and regression analyzes were used most in the studies they analyzed, ANOVA test was used the least.

Trends research can be useful in demonstrating the current situation of an area and the situation in the past, in observing the change and provide a prediction for prospective research (Erdogmus & Cagiltay 2016; Turan & Akdag-Cimen, 2020). Also, trend studies can help researchers avoid topical overlaps (Li & Li, 2020). In addition, examining the doctoral dissertations conducted in the field of ET in a comprehensive and detailed way and turning them into an information network will also inspire new research in the field. So, this study aims to reveal the “methodological” and “research” trends in doctoral dissertations which were made in the area of ET. This study also aims to reveal the statistical analysis trends. Revealing the statistical trend of the theses in the field of ET adds a unique dimension to this study. Also, while the articles are generally examined in trend studies, detailed distributions of the keywords used in the analyzed articles are presented. Providing a comprehensive analysis of the keywords used in doctoral dissertations is another unique aspect of this study. The following research questions were formulated to determine the trends in the doctoral dissertations produced in the area of ET in Türkiye between 2011 and 2020:

- How is the *methodological and research trend* in doctoral dissertations?
- How is the *statistical analysis trend* in quantitative doctoral dissertations?
- What are the *most used keywords* in doctoral dissertations?

Method

This study uses the design of document analysis- a qualitative research approach- to determine the methodological and statistical trends stated in the purpose of this paper. Document analysis is a systematic process in which electronic or printed documents are analysed and evaluated (Bowen 2009).

The dissertation selection process

The dissertations analysed in this study were accessed through the National Dissertation Database of the council of higher education (YÖK). Thus, 292 accessible PhD dissertations which were produced in the department of computer education and instructional technology (CEIT) between the years 2011 and 2020 constitutes the sampling of this study.

Data collection tool

A data collection form was developed by the researchers to analyse the dissertations. The form was developed on the basis of "ET publication classification form (ETYSF) developed by Göktaş et al. (2012b) and of various books about research methods (Creswell 2013; Fraenkel et al., 2012; Johnson & Christensen 2008; McMillan & Schumacher 2010). Statistical analysis and assumption techniques were determined and classified on the basis of studies conducted by Bangert and Baumberger (2005), Field (2013) and Skidmore and Thompson (2010). Expert opinion was consulted for the draft form created in consequence of literature review and final version of form was created.

Data analysis

This study uses content analysis to analyse the dissertations. Content analysis aims to analyse data in depth and to present the data and situations similar to each other by classifying on the basis of certain concepts and themes (Yıldırım & Şimşek 2016). So, the doctoral dissertations analyzed by content analysis method to determine the methodological and statistical techniques they had used.

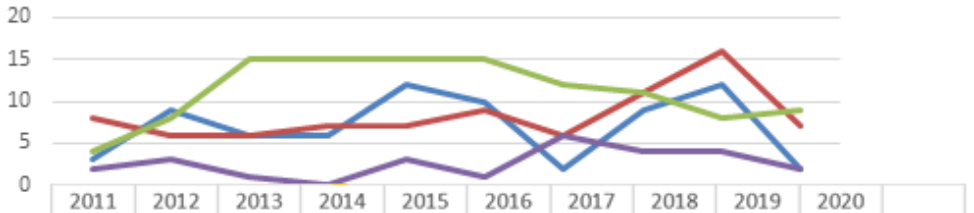
In the study, each dissertation was read once by the researchers. The data collection form was integrated into Google Forms to prevent re-analysing the already analysed dissertations and to have consistency in the data. After the reading process, the data were entered in the DAF separately by each researcher. In addition, while the researchers analyzed all theses, they also noted the codes and themes. After the researchers completed the data entry of all the dissertations, an online meeting was held to check whether there were different data entries. In meeting, all data entered by the researchers were evaluated one by one. When there are different codes and themes revealed among researchers as a result of the analysis, that dissertations were re-analyzed. After making sure there was no inconsistent data, the reporting process was started. In the reporting process, if the same analysis technique is used more than once in a dissertation, it was regarded as used once. It is also useful to note that; since more than one research approach, data collection tool, sampling method, data analysis method, statistical and assumption technique were used in theses, the findings should be evaluated accordingly. The findings were shown by using descriptive statistical techniques such as frequencies, percentages and graphs.

Findings

RESEARCH TRENDS

Research approach and research design

It was found that mixed and quantitative research approaches were chosen in the majority of the 292 dissertations that were analysed. The findings demonstrated that mixed method approaches were also preferred but that multi-method approaches were less preferred. The details about the approaches used in the dissertations are shown in Fig1.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Quantitative	3	9	6	6	12	10	2	9	12	2	71
Qualitative	8	6	6	7	7	9	6	11	16	7	83
Mixed	4	8	15	15	15	15	12	11	8	9	112
Multi Method	2	3	1	0	3	1	6	4	4	2	26

Figure 1. Research methods

Classifications made in the research methods books by Fraenkel et al., (2015) and by McMillan and Schumacher (2010) were used in preparing the Table 1. It was found that quasi-experimental and survey models (quantitative), case study (qualitative) and explanatory and embedded (mixed) were preferred more in the dissertations. On the other hand, it was found that pre-experimental (quantitative), phenomenology (qualitative) and triangulation and exploratory design (mixed) were preferred less.

Because quantitative and qualitative designs are used separately in multi-method research approaches, they were classified within quantitative and qualitative designs. In addition, “Design-Based Research” and “Action Research”, which are not included in a specific research method in the reference books, are presented under the title “*other*”. The expression "unspecified" in the table means that the research design used in the dissertations is not clearly stated.

Findings about research designs are shown in Table 1.

Table 1. Research designs

	F	***%***
Quantitative	***152***	***100***
Quasi-Experimental	43	28.3
Survey	30	19.7
Experimental	20	13.2
Factorial Design	17	11.2
Correlational	15	9.9
Ex-Post Facto	5	3.3
Comparative	4	2.6
Pre-Experimental	4	2.6
Unspecified*	14	9.2
Qualitative	***87***	***100***
Case Study	51	58.6
Unspecified*	18	20.7
Phenomenology	9	10.3
Other**	9	10.3
Mixed	***91***	***100***
Explanatory	24	26.4
Embedded	18	19.8
Unspecified*	16	17.6
The Convergent Parallel Design	10	11.0
Exploratory	9	9.9
Triangulation	7	7.7
Other***	7	7.7
Other	***39***	***100***
Design-Based Research	29	74.4
Action Research	10	25,6

*It refers to studies whose research method is specified but whose design is not specified.
**It refers for designs expressed as ethnographic, critical research, developmental research etc.
***It refers to concurrent equal status design, increased regression trees etc.

Samples

The Table was prepared on the basis of the sample classification made by Dawson and Kumar (2014). An examination of Table 2 shows that university students are the most preferred samples. Of university students, students attending educational faculties are the most frequently used in samples. Other groups of samples were mostly teachers. Samples of university graduates were found to be the least preferred samples. The details are shown in Table2.

Table 2. *Samples*

		f	*%*
	Post-Secondary	***165***	***100***
	Undergraduate Student	136	82.4
	Pre-service Teacher	*104*	*76.5*
	Others	*32*	*23.5*
	Associate Degree	14	8.5
	Doctoral or Master Degree	11	6.7
	Unspecified*	4	2.4
Student	*K-12*	***93***	***100***
	Secondary	46	49.5
	High School	13	14
	Elementary	12	12.9
	Special Educational Needs and Disabilities	9	9.7
	Pre-School	6	6.5
	Gifted	2	2.2
	Unspecified*	5	5.4
		146	***100***
	Teacher	51	34.9
	Academic	29	19.9
	Administrators (School, Institution)	12	8.2
Other	Field Experts	12	8.2
	Parent of Students	8	5.5
	Material/Document	4	2.7
	University Graduates	3	2.1
	*Other***	27	18.5

* It refers to the studies in which the student level is not specified.
**It refers to all sample types that could not be included in the category (doctor, engineer, support staff, etc.)

Sampling techniques

Sampling techniques were determined according to the classifications made by Johnson and Christensen (2008), MacMillan and Schumacher (2010) and Schreiber and Asner-Self (2011). It was found that sampling techniques was not stated in a considerable part of the dissertations. Purposive sampling, convenience sampling and simple random sampling were found to be the most frequently preferred sampling techniques. On the other hand, such techniques as stratified sampling, snowball sampling and whole population were found to be preferred rarely. It was also found that more than one technique was used in one-stage or multi-stage form in some of the dissertations. The details are shown in Table 3.

Table 3. Sampling techniques

			f	*%*
Nonprobability	Purposive	Purposive Sampling	83	26.3
		Maximal Variation Sampling	12	3.8
		Critical Case Sampling	8	2.5
		Stratified Sampling	6	1.9
		Volunteer Sampling	3	1.0
		Snowball Sampling	3	1.0
			115	***36.5***
	Convenience Sampling		***44***	***14***
Probability	Simple Random Sampling		27	8.6
	Cluster Random Sampling		10	3.2
	Stratified Random Sampling		3	1
			40	***12.7***
Whole population			***5***	***1.6***
*Unspecified**			***111***	***35***

*It refers to the studies that are not specified the sampling technique.

STATISTICAL TRENDS OF QUANTITATIVE STUDIES

Statistical techniques

The statistical analysis techniques were classified on the basis of classification made by Bangert and Baumberger (2005). On examining the statistical analysis techniques used in the dissertations, it was found that largely basic statistical techniques were preferred. Accordingly, descriptive (basic statistics), ANCOVA (intermediate statistics) and multiple regression (advanced statistics) were preferred frequently. In cases where the same data analysis technique was used more than once, the data was collected as used once. The findings obtained should be evaluated by considering the situation. The details are showed in Table 4.

Table 4. Statistical analysis techniques of quantitative studies

	f	*%*
Basic Statistics	***800***	***83.7***
Descriptive Statistics	***450***	***47.1***
Mean	*127*	*13.3*
Standard Deviation	*109*	*11.4*
Frequency	*102*	*10.7*
Percent	*85*	*8.9*
Graphs	*15*	*1.6*
Mod/Median	*6*	*0.6*
Range	*4*	*0.4*
Standard Error	*2*	*0.2*
Independent Samples T-Test	84	8.8
One-Way ANOVA	84	8.8
Pearson/Spearman/Kendall Correlation	41	4.3
Mann-Whitney U	35	3.7
Paired Samples T-Test	34	3.6
Kruskal-Wallis	18	1.9
Chi-Square	15	1.6
Wilcoxon Signed Rank Test	12	1.3
Simple Linear Regression	9	0.9

Correlation (Unspecified)	7	0.7
Cross-tabs	3	0.3
Welch ve Brown-Forsythe Test	2	0.2
One-Sample T-Test	2	0.2
Freidman	2	0.2
Partial Correlation	1	0.1
Fisher's Exact Test	1	0.1
Intermediate Statistics	***99***	***10.4***
ANCOVA	46	4.8
Two-Way ANOVA	17	1.8
Post-Hoc Tests	15	1.6
MANOVA	15	1.6
Repeated-Measures ANOVA	4	0.4
Factorial Design ANOVA	1	0.1
Mixed Design ANOVA	1	0.1
Advanced Statistics	***57***	***6***
Multiple Linear Regression	18	1.9
Factor Analysis (AFA, DFA)	14	1.5
Structural Equation Modelling	8	0.8
Path Analysis	4	0.4
Data Mining	2	0.2
Logistic/Boosted Regression	2	0.2
*Other**	9	0.9

*Log, lag, cluster, debriefing protocol analysis etc.

Effect size

The findings concerning the effect size presented in the dissertations are shown in Table 5. It was found in a majority of the quantitative dissertations eta square was the most frequently used effect size. In addition, it is seen that analyzes that do not require effect size calculation in the type of descriptive statistics are frequently used. On the other hand, Omega/Omega-Squared and Hedges' g were found to be used less as effect size. It is seen that although effect size calculations were made, there were also studies in which the type was not specified. In addition, although analyzes that require effect size calculation are performed in theses, it is seen that effect size calculation is not done.

Table 5. Effect sizes of quantitative studies

	f	***%***
Eta Squared	80	37.0
A situation with an impact has not been investigated. *	53	24.5
The effect has not been examined. **	29	13.4
R Squared/r	25	11.6
Cohen's d/Cohen's f	20	9.3
Unspecified Effect Size Type	6	2.8
Omega/Omega- Squared	2	0.9
Hedges' g	1	0.5

* Analyzes that do not require effect size calculation (Descriptive analysis etc.)
**It shows the studies in which the effect size was not calculated.

Statistical techniques used for validity and reliability in the data collection instruments

Qualitative validity and reliability techniques were not included in this study, which aimed to reveal the statistical trend. While Cronbach's Alpha is the most used technique, it is seen that factor analysis is frequently used, later. Kendall's tau / Kendall' S, Rosenthal's reliable N coefficient and Out of Bag Error are seen as the least used techniques. In addition, it is stated that there are very few studies in which the validity and reliability of data collection tools were not tested. The detailed information is shown in Table 6.

Table 6. Statistical techniques used for validity and reliability of data collection tools

	f	***%***
Cronbach Alpha	116	37.2
Confirmatory Factor Analysis	46	14.7
Explanatory Factor Analysis	39	12.5
KR-20/KR-21	38	12.2
Inter-Rater Reliability	26	8.3
Spearman/Pearson Correlation	12	3.8
Cohen’s Kappa	8	2.6
Test-Retest	7	2.2
Factor Analysis (Unspecified)	3	1
Cross validation	3	1
Guttman Split half	2	0.6
Kendall’s Tau/Kendall’ S	2	0.6
Rosenthal's reliable N coefficient	1	0.3
Out of Bag Error	1	0.3
Testing for validity and reliability was not performed.	**8**	***2.6***

Statistical techniques used in the assumptions evaluating

Accordingly, it is evident that mostly basic statistical assumption techniques were used. Basic refers to the techniques used for analysis (t-test, ANOVA, etc.) that aim to reveal simple level relationships. Advanced refers to the techniques used for analyzes (Regression, MANOVA, etc.) to reveal more complex relationships. While it was found that Skewness-Kurtosis (basic) and Box test (advanced) were the most used ones, Scatter plot, Mahalonobis Distance and Leverage Test are the least. Lastly, the techniques that are cannot be categorized and with a frequency of 1 are presented under the heading "other". The techniques are detailed in Table 7.

Table 7. Statistical techniques used in the assumptions evaluating

	f	***%***
Basic	***254***	***84***
Skewness-Kurtosis	82	27.2
Levene's Test	54	17.9
Shapiro-Wilk	37	12.3
Histogram	23	7.6
Kolmogorov-Smirnov Test	27	8.9
Q-Q Plot Graph	17	5.6
P-P Graph	6	2
Independent Samples T-Test	5	1.7
Scatter plot	3	1
Advanced	***33***	***11***
Box Test	14	4.6
Mauchly's Sphericity Test	10	3.3

Cook's Distance	3	1
Durbin-Watson Test	2	0.7
Leverage Test	2	0.7
Mahalonobis Distance	2	0.7
Other*	**15**	**5**

*Multicollinearity and singularity, Bartlett coefficient, Linear correlation, Z-scores etc.

Keyword Analysis

There are 1376 keywords in the dissertations examined within the scope of the study. Classifications prepared by Baydas et al., (2015) and Kucuk et al., (2013) were used to reveal the tendency in these keywords. While classifying, they are presented in 5-year periods. In this way, it can be seen how the use of keywords changes over time. The most repetitive keywords are presented under the relevant category. Keywords that do not fall into any category are listed as “other”.

In the Learning Environments & Technology category, while the keywords of “social media”, “video”, and “mobile learning” were most used between 2011 and 2015, the keywords “mobile technologies”, “programming education”, and “multimedia” were most used between 2016-2020. In the category of "Distance Education & Learning", it is seen that the keywords online learning and distance education are the most used keywords in the last 10 years. The fact that there are more different keywords in the field of distance education between 2011 and 2015 and the number of them is higher shows that more distance education studies have been carried out compared to the last 5 years. While “ICT Integration”, “cognitive/teaching/social presence”, and “learning objects” were most used in the category of “Research or Learning approaches/theories” in 2011-2015, it is seen that the “flipped classroom”, “computational thinking”, and “cognitive load” were used more frequently in 2016-2020. While Design and Development Research and Scale Development were used the most in the “Design & Development” category in 2011-2015, it is seen that the keywords “professional development” and “Instructional Design” were used more frequently between 2016-2020. In the category of “Assessment/Evaluation” it is seen that the keywords "assessment and performance" have been predominantly preferred in the last 10 years. When the independent variables discussed in the theses are examined, it is seen that the keywords "achievement", "motivation" and "engagement" are the keywords used in the last 10 years. When the most used keywords that cannot be included in the category are examined, it is seen that the keywords "special education" and "skill" are used the most in the last 10 years. Categorized keywords are presented in Table 8.

Table 8. The most used keywords.

	Learning Environments & Technology (150)	Distance Education & Learning (61)	Research or Learning approaches/theories (140)	Design & Development (31)	Assessment/ Evaluation studies (51)	Dependent Variable (119)	Other (54)
2011 – 2015	- Social Media (11) - Video (8) - Mobile Learning (7) - Multimedia/Hypermedia (7) - Programming (6) - Augmented Reality (5) - Robotics in education (5) - 3D Virtual Worlds (4) - Web 2.0/Web 3.0 (3) - Eye tracking (3) - Cloud Computing (2)	- Online Learning (10) - Distance Education (7) - Web based learning/instruction (7) - E-learning (6) - Online learning environment (5) - Online Interaction (3) - Online collaborative learning (2) - Learning Management System(2)	- ICT Integration (12) - Cognitive/Teaching/Social Presence (9) - Learning Objects (8) - Cognitive Load (5) - Adaptive Learning (4) - Problem Based Learning (4) - Technology Acceptance Model (4) - Collaborative Learning (3) - Design Based Research (3) - Critical thinking (3) - Community of Inquiry (3) - Blended Learning (3) - Flipped Classroom (2)	- Design and Development Research (4) - Scale Development (3) - Professional Development (2) - Instructional Design (2) - Course Design (2) - Interface/Game design (2)	- Evaluation (7) - Performance (7)*** - Assessment (4) - Portfolio (4) - Electronic Performance Support System (3) - Quality assurance (2) - Feedback (2)	- Achievement (11) - Motivation (11) - Engagement (9) - Attention (5) - Perception (5) - Self-Efficacy (5) - Success (5) - Awareness (4) - Attitude (3) - Satisfaction (2)	- Special Education (9)* - Metacognition (4) - Skills (4)** - Informal Learning (3) - Locus of control (3) - Lifelong Learning (2) - Formal learning (2)
2016 - 2020	- Mobile Technologies (20) - Programming Education (17) - Multimedia/Hypermedia (11) - Educational/3D game (9) - 3D virtual environments (6) - Virtual Reality (5) - Augmented Reality (5) - Digital storytelling (4) - Eye Tracking (3) - LEGO (3) - Robotics (2) - E-book (2) - Simulation (2)	- Online Learning (7) - Distance Education (5) - Online course/education (3) - E-Learning (2) - Online Risks (2)	- Flipped Classroom (12) - Computational Thinking (8) - Cognitive Load (7) - Problem Based Learning (6) - Design Based Research (6) - Cognitive/Teaching/Social Presence (5) - Gamification (5) - Technology Integration (5) - Community of Inquiry (4) - Technology Acceptance Model (4) - Blended Learning (4) - Collaborative Learning (3) - Working Memory (3) - Learning Analytics (3) - Self Regulated Learning (2)	- Professional Development (5) - Instructional Design (3) - Emotional Design (2) - Design Principles (2) - Curriculum development (2) - Course Design and Development (2)	- Performance (5)*** - Assessment (4) - Feedback (4) - E-assessment (3) - Electronic Performance Support System (2) - Educational Technology Standards (2) - Portfolio (2)	- Achievement (14) - Engagement (13) - Motivation (12) - Self-Efficacy (5) - Abstraction (3) - Attitude (3) - Perception (3) - Satisfaction (2) - Success (2) - Academic performance (2)	- Special Education (8)* - Cyberbullying (5) - Skill (5)** - Problem solving (3) - Metacognition (2) - Internet Addiction (2) - Multitasking (2)

* Learning disability, mental disability, autisim etc.
** 21. century skills, Cognitive skill, Daily Living Skills, Narrative Skill, Basic Science Process Skills, high ordered thinking skills, Spatial Skills etc.
***Psychomotor Performance, coding performance, task performance etc

Discussion and Conclusion

This study analyzed the doctoral dissertations produced in the area of ET in the period between 2011 and 2020 in terms of the methods and statistical analysis techniques they used. Accordingly, it was found that the mixed method was used in the great majority of the dissertations. The preference for mixed methods in doctoral dissertations may result from the fact that these studies, which are considered scientifically important, aim to produce more important results. This was a finding in parallel to the one obtained by Kinshuk et al. (2013) in their study analyzing articles in the field of ET. Kara Aydemir and Can (2019) also found that the mixed method was on the increase, especially in recent years. However, Küçük et al. (2013), Göktaş et al. (2012b), Asdaque & Rizvi (2019), and Abdelghani (2020) stated that quantitative research is used less. On the other hand, Anderson et al. (2021) found that qualitative approaches were used more frequently. Inconsistencies between findings of the previous studies can be the indicator of the fact that quantitative and qualitative research approaches are always needed but that the frequency of preference for them changes over time. It can be said that mixed methods may be preferred in the future, especially in doctoral dissertations. Because mixed research methods consist of quantitative and qualitative data, they have the potential to provide richer and more comprehensive information. The simultaneous use of quantitative and qualitative data will also minimize the deficiencies that may occur in the data collection process.

As a result of the analysis, it has been revealed that quasi-experimental, case study, and survey designs are used more than other designs. Similar to this result, Erdogmus and Cağıltay (2016) stated that quasi-experimental, case study, and survey designs were mostly used in the postgraduate dissertations they analyzed. Likewise, Alkraiji and Eidaroos (2016) stated that quasi-experimental and case-study designs were predominantly used in the articles they analyzed. Also, Asdaque & Rizvi (2019)-who analyzed doctoral dissertations on distance education- and Yildiz et al., (2020) stated that survey design is the mostly used research type. The finding that survey design was the most frequently preferred design was in parallel to the one obtained by Göktaş et al. (2012b). But Alkraiji and Eidaroos (2016) found that the survey design was found to be the least preferred research design and Alper and Gülbahar (2009) found that the number of experimental studies was less. Experimental study, especially in social areas, is not easy for various reasons (random sampling, etc.). Therefore, it is thought that this result in the studies is not very surprising. In addition, survey design helps researchers in collecting short-term and instant data. They can instantly collect data from large samples. For these reasons, it is thought that the survey design is mostly used.

It was found in this study that university students were the most frequently preferred samples and previous studies also report that undergraduate students were preferred more frequently (Durak et al., 2018; Erdogmus & Cagiltay 2016; Krul & Duart 2017). However, unlike the results of this study, Asdaque & Rizvi (2019) stated that graduate students are the most preferred sample in the doctoral dissertations they analyzed (2001-2014). Also, in our study, the samples in the dissertations were mostly composed of students of educational faculties. This result is similar to the study by Yıldız et al., (2020). On the other hand, convenience or purposeful sampling was preferred more often. Also, the number of dissertations in which the sampling method was not stated was extremely big. A similar study conducted by Alper and Gülbahar (2009) also pointed out that the sampling method was not specified in a great majority of the studies they analyzed. Sampling methods are considerably influential in conducting, generalizing, and repeating a study and in readers' thoughts on the quality of findings and of the study (Gibbs et al. 2007). It can be said that the fact that sampling methods have not been stated in dissertations is a serious inadequacy. In the studies where the types of

sampling methods chosen were specified, however, it was found that purposive sampling, random sampling, and convenience sampling were the most frequently preferred types of sampling. It was a finding similar to the one obtained by Kucuk et al. (2013).

An examination of the statistical data analysis techniques showed that mostly basic descriptive statistics (mean, standard deviations, frequencies, percentages, etc.) were mostly used. It was a finding supportive of the finding that descriptive data analysis methods were the most frequently preferred data analysis methods. In addition to that, Kiliç-Çakmak et al. (2013), Kucuk et al. (2013), and Asdaque & Rizvi (2019) also found that basic statistical analysis techniques were the most frequently preferred analysis techniques. In a similar way, Bangert and Baumberger (2005) also found that generally basic statistical techniques were used in the articles they analyzed. Apart from that, it was found that such advanced statistical techniques as factor analysis and regression- which Skidmore and Thompson (2010) stated would increase- were not used very much in the dissertations.

Researchers in the literature are usually recommended to state effect size (Kelley & Preacher 2012) because effect size informs other researchers or readers substantially of the counterpart of the study in practice (Bangert & Baumberger 2005). Yet, despite those recommendations, the effect size for the tests used was not presented in the dissertations analyzed. In the studies giving effect size, it was found that Eta squared effect size was usually calculated. It is necessary to perform statistical tests in some cases for the validity or reliability of data collection tools or the data collection process. It was found that Cronbach's Alpha internal consistency coefficient, whose reliability was often preferred, was used in the dissertations. It was also found that confirmatory and exploratory factor analysis were also the statistical techniques frequently used for validity or reliability.

Of the assumptions taken into consideration, normality distribution and homogeneity of variances were found to be the most frequently used type of assumption in the dissertations. Hu & Plonsky (2021) stated that the normality test is generally used in the assumptions reported in the studies they analyzed. In addition to that, skewness and kurtosis values were the most frequently chosen statistical techniques used in the assumptions in the dissertations. Therefore, it was found that the findings concerning the assumptions taken into consideration and the statistical techniques used for the assumptions were consistent.

The analyses performed showed that the dissertations generally tended to use basic statistical techniques (independent samples t-test, ANOVA, etc.). Similar to the results of the research, Durak et al., (2018) and Yildiz et al., (2020) stated that the t-test was mainly used in the studies they analyzed. Additionally, it was found that descriptive statistics as a quantitative research approach and content analysis as a qualitative research approach were generally used in the dissertations as the methods of data analysis. Although the "Thematic and discourse analysis" methods were seen to be used very little in this study, Abdelghani (2020) stated that "Thematic/Discourse analysis" is the most used analysis method after descriptive statistics in the studies they analyzed.

In the studies of Kara Aydemir and Can (2019), it is seen that the studies conducted under the title of "Assessment and evaluation" were more intense between the years 2006-2010. In addition, it is seen that the studies under the title of "Pedagogy, theory of learning/instruction/ teaching" are intense between the same years. On the other hand, Nurzhanov et al., (2021) stated that after ET keyword, the keywords respectively "*Students*", "*E-learning*" and "*Computer-aided Instruction*" were the most preferred. Chen et al. (2020b) also stated that the keywords "student", "education", "environment", and "technology" are among the prominent keywords. Kimmons (2020) stated that the keywords "*online*", "*mobile*", "*flipped classroom*" have come to the fore in the last 5 years. In

this study, it is seen that the keyword flipped classroom has been used the most in the last 5 years and has taken first place. Martin et al., (2018) revealed that there was a very rapid increase in flipped classroom studies published in web of science and in google scholar between 2012 and 2016 in their study where they determined the trends. In addition, Ekici (2021), in his systematic review study, revealed that the number of studies that used the keywords "gamification" and "flipped learning", which were published between 2016-2019, increased as they approached the present day. These results appear as findings that support the increase in the flipped classroom in the last 5 years in our research. Currently, it is seen that the field of distance education is preferred in dissertations. It is foreseen that distance education, whose use has increased with the covid-19 pandemic, will take place more in the studies carried out, especially in the coming years.

Chen et al. (2020b) stated that there was a significant increase in the keyword "*game-based learning*" in the studies between 2003 and 2006, also Lai & Bower (2020) stated that the subject of "*games/mobile games*" was mostly preferred in the studies they analyzed between 2009-2018. In addition, Dubé & Wen (2021), in their analysis, revealed that the studies in the fields of game-based learning, games, and gamification between 2011 and 2018 continue to increase every year. Hwang and Chen (2022), on the other hand, stated that 3 of the 10 most used keywords in the articles published in 7 SSCI journals they analyzed are about "game". In our study, it is seen that the increase in the field of "Educational/3D game" in the last 5 years is similar to the literature. With the effect of developing graphics and technology, virtual environments affect people very seriously. In this case, the game genre reveals the need to investigate the effect of virtual environments in educational environments. In addition, it is inevitable to use game-like environments in education in order to motivate today's digital natives and increase their efficiency in the learning process.

Similar to the study of Yildiz et al., (2020), within the scope of this study, while "perception" and "attitude" variables have been examined less than other variables in the last 10 years, Alkraiji and Eidaroos (2016) stated that "user's perceptions and attitude" is the most examined variable. On the other hand, Yildiz et al., (2020) stated that “teacher view and student view” and “Technology attitudes towards ET” researches were more most in the studies they analyzed.

Chen et al., (2019) stated that keyword motivation is in the 24th rank among the top 25 keywords that stand out in their 40-year bibliometric analysis study. In addition, they stated that the keyword "motivation", which appeared as a rarely used keyword between "1978 - 2007" in the same study, was used quite a lot between 2008 and 2018, which will increase 6 times compared to previous years. Durak et al., (2018) stated that one of the most examined variables in the studies they analyzed is motivation. In this study, it is seen that the keyword "motivation" is among the most used variables in the last 10 years, and it is similar to the studies in the literature. Considering that motivation has important effects on the learning process, this result is not surprising. In addition, considering that technology creates serious motivation for individuals, the motivation variable will continue to be investigated as new technologies are used in learning environments.

When the results of this study are examined, it is seen that augmented reality studies are consistently among the most studied areas in the last 10 years. Virtual reality, another prominent and rapidly increasing technology in education in recent years, has been more studied by researchers in recent years (Dubé & Wen 2021; Hwang & Chen, 2022; Oyelere et. al., 2020). Especially in horizon reports, there are predictions that the use of virtual reality will increase in recent years. Within the scope of this study, the increase in the use of virtual reality and virtual environments, especially in the last 5 years, is in parallel with the literature. When we evaluate the findings in relation to this result, the fact that especially augmented and virtual reality studies are used more often brings along

the use of mobile technologies more.

It is seen that keywords such as "distance education", "online learning" and "web-based learning" are used to express distance education in the analyzed studies. In addition to these keywords, a new notion has come to the fore with the COVID-19 pandemic, which has affected the world. This concept is expressed as “emergency remote teaching” (Bozkurt & Sharma, 2020). At this point, it is foreseen that this keyword will come to the fore more within the scope of theses to be completed after the pandemic. In addition, it can be predicted that emerging technologies (e.g., virtual reality, artificial intelligence) are predicted to trend in the future (Dubé & Wen, 2021) and hybrid learning approaches will gain more importance in the post-pandemic period. Finally, increasing in use in the last 5 years mobile learning and artificial intelligence should be firmly connected and used to support an innovative system (Cho et al., 2020).

The findings obtained in this study are limited to 292 doctoral dissertations produced in Türkiye in the field of ET. In terms of providing a rich perspective on the field of educational technologies, similar studies can be carried out in different countries to make comparisons. Since the analyzed theses were tried to be handled with all their dimensions, only the last 10 years were included in the analysis. In addition, statistically presented data were reported using descriptive analysis. Studies related to ET available in other disciplines were not included in the scope of this study. Therefore, the findings obtained should be evaluated accordingly. In the light of the findings obtained, the following recommendations can be made:

- It became apparent that a considerable number of doctoral dissertations preferred to have samples of educational faculty students. Sampling of different types of students is important in that it enriches areas of study, and it develops different perspectives.
- More important inferences can be made by using the less preferred advanced statistics in dissertations.
- Detailed explanations should be made about how assumptions such as normality or homogeneity are satisfied in the studies to be conducted, because such explanations are important for the validity and reliability of the studies.
- The statistical analysis of the studies in the literature the evaluation of whether the assumptions are fulfilled rather than a descriptive approach while doing will bring a different perspective to the subject.
- A comparison can be made in terms of publication type by analyzing the keywords used in trend studies in which articles and dissertations are examined.

References

Abdelghani, B. (2020). Trends in MOOCs Research: Analysis of Educational Technology Journals. *International Journal of Emerging Technologies in Learning (IJET), 15*(17), 47. https://doi.org/10.3991/ijet.v15i17.14637

Alkraiji, A., & Eidaroos, A. (2016). Trends and Issues in Educational Technology Research in Saudi Higher Education: A Meta-Analysis Review. *Journal of Education and Practice, 7*(36), 62-79.

Anderson, T., Saunders, G., & Alexander, I. (2021). Alternative dissertation formats in education-based doctorates. *Higher Education Research & Development, 0*(0), 1–20. https://doi.org/10.1080/07294360.2020.1867513

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, 8*(2), 124-135.

Altinpulluk, H. (2019). Determining the trends of using augmented reality in education between 2006-2016. *Education and Information Technologies, 24*(2), 1089–1114. https://doi.org/10.1007/s10639-018-9806-3

Asdaque, M. M., & Rizvi, S. A. A. (2019). Exploring the Research Trends-Related Imbalances in Doctoral Level Research on Distance Education in Pakistan. *Pakistan Journal of Distance and Online Learning, 5*(1), 105-122.

Bangert, A. W., & Baumberger, J. P. (2005). Research and statistical techniques used in the Journal of Counseling & Development: 1990–2001. *Journal of Counseling & Development, 83*(4), 480-487. https://doi.org/10.1002/j.1556-6678.2005.tb00369.x

Baydas, O., Kucuk, S., Yilmaz, R. M., Aydemir, M., & Goktas, Y. (2015). Educational technology research trends from 2002 to 2014. *Scientometrics, 105*(1), 709-725. https://doi.org/ 10.1007/s11192-015-1693-4

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal, 9*(2), 27-40. http://dx.doi.org/10.3316/QRJ0902027

Bozkurt, A., & Sharma, R. C. (2020). Emergency remote teaching in a time of global crisis due to CoronaVirus pandemic. *Asian Journal of Distance Education, 15*(1), i–vi. https://doi.org/10.5281/zenodo.3778083

Chen, X., Yu, G., Cheng, G., & Hao, T. (2019). Research topics, author profiles, and collaboration networks in the top-ranked journal on educational technology over the past 40 years: a bibliometric analysis. *Journal of Computers in Education, 6*(4), 563–585. https://doi.org/10.1007/s40692-019-00149-1

Chen, X., Zou, D., & Xie, H. (2020a). Fifty years of British Journal of Educational Technology: A topic modeling based bibliometric perspective. *British Journal of Educational Technology, 51*(3), 692–708. https://doi.org/10.1111/bjet.12907

Chen, X., Zou, D., Cheng, G., & Xie, H. (2020b). Detecting latent topics and trends in educational technologies over four decades using structural topic modeling: A retrospective of all volumes of Computers & Education. *Computers & Education, 151*, 103855. https://doi.org/10.1016/j.compedu.2020.103855

Cho, E., Cho, Y. H., Grant, M. M., Song, D., & Huh, Y. (2020). Trends of Educational Technology in Korea and the U.S.: A Report on the AECT-Korean Society for Educational Technology (KSET) Panel Discussion. *TechTrends, 64*(3), 357–360. https://doi.org/10.1007/s11528-020-00493-5

Creswell, J. W. (2013). *Qualitative inquiry & research design: Choosing among five approaches.* CA: Sage Publications.

Dawson, K. & Kumar, S. (2014). An analysis of professional practice Ed. D. dissertations in educational technology. *TechTrends, 58*(4), 62-72. https://doi.org/10.1007/s11528-014-0770-5

Dubé, A. K., & Wen, R. (2021). Identification and evaluation of technology trends in K-12 education from 2011 to 2021. *Education and Information Technologies.* https://doi.org/10.1007/s10639-021-10689-8

Durak, G., Cankaya, S., Yunkul, E. & Mısırlı, Z. (2018). A content analysis of dissertations in the field of educational technology: The case of Turkey. *Turkish Online Journal of Distance Education, 19* (2), 128-148. DOI: 10.17718/tojde.415827

Ekici, M. (2021). A systematic review of the use of gamification in flipped learning. *Education and Information Technologies, 26*(3), 3327–3346. https://doi.org/10.1007/s10639-020-10394-y

Erdogmus, F. U., & Cagiltay, K. (2016). General trends in master's and doctoral theses in the field of educational technologies in Turkey. K. Çağıltay & Y. Göktaş (Eds.). Fundamentals of instructional technologies: Theories, research, trends. (2nd ed.), (pp. 567-581). Ankara: Pegem Academy.

Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th Edition). London: Sage.

Fraenkel, W., & Wallen, N. H. (2012). *How to design and evaluate research in education* (8th ed.). New York: McGraw-Hill

Gibbs, L., Kealy, M., Willis, K., Green, J., Welch, N., & Daly, J. (2007). What have sampling and data collection got to do with good qualitative research? *Australian and New Zealand Journal of Public Health*, *31*(6), 540-544. https://doi.org/10.1111/j.1753-6405.2007.00140.x

Göktaş, Y., Hasancebi, F., Varisoglu, B., Akçay, A., Bayrak, N., Baran, M., & Sözbilir, M. (2012a). Trends in educational research in Turkey: A content analysis. *Educational Sciences: Theory and Practice*, *12*(1), 455-460.

Göktaş, Y., Kucuk, S., Aydemir, M., Telli, E., Arpacık, Ö., Yıldırım, G., & Reisoğlu, İ. (2012b). Educational technology research trends in Turkey: A content analysis of the 2000-2009 decade. *Educational Sciences: Theory & Practice*, *12*(1), 177-199.

Hsu, Y. C., Hung, J. L., & Ching, Y. H. (2013). Trends of educational technology research: more than a decade of international research in six SSCI-indexed refereed journals. *Educational Technology Research and Development, 61*(4), 685-705. http://dx.doi.org/10.1007/s11423-013-9290-9

Hu, Y., & Plonsky, L. (2021). Statistical assumptions in L2 research: A systematic review. *Second Language Research, 37(*1), 171–184. https://doi.org/10.1177/0267658319877433

Hwang, G.-J., & Chen, P.-Y. (2022). Interweaving gaming and educational technologies: Clustering and forecasting the trends of game-based learning research by bibliometric and visual analysis. *Entertainment Computing, 40*, 100459. https://doi.org/10.1016/j.entcom.2021.100459

Johnson, B., & Christensen, L. (2008). Educational research: Quantitative, qualitative, and mixed approaches. Los Angeles: Sage Publications.

Kara Aydemir, A. G., & Can, G. (2019). Educational technology research trends in Turkey from a critical perspective: An analysis of postgraduate theses. *British Journal of Educational Technology, 50*(3), 1087-1103. doi:10.1111/bjet.12780

Kelley, K., & Preacher, K. J. (2012). On effect size. *Psychological Methods, 17*(2), 137-152. http://dx.doi.org/10.1037/a0028086

Kiliç-Çakmak, E., Çebi, A., Mihçi, P., Günbatar, M. S., & Akçayir, M. (2013). A content analysis of educational technology research in 2011. *Procedia-Social and Behavioral Sciences, 106*, 74-83. https://doi.org/10.1016/j.sbspro.2013.12.010

Kimmons, R. (2020). Current Trends (and Missing Links) in Educational Technology Research and Practice. *TechTrends, 64*(6), 803–809. https://doi.org/10.1007/s11528-020-00549-6

Kinshuk, Huang, H. W., Sampson, D., & Chen, N. S. (2013). Trends in educational technology through the lens of the highly cited articles published in the Journal of Educational Technology and Society. *Educational Technology & Society, 16*(2), 3–20

Krull, G. & Duart, J. M. (2017). Research trends in mobile learning in Higher Education: A systematic review of articles (2011–2015). *International Review of Research in Open and Distributed Learning, 18*(7), 1-23. http://dx.doi.org/10.19173/irrodl.v18i7.2893

Kucuk, S., Aydemir, M., Yildirim, G., Arpacik, O., & Goktas, Y. (2013). Educational technology research trends in Turkey from 1990 to 2011. *Computers & Education, 68*(2013), 42-50. https://doi.org/10.1016/j.compedu.2013.04.016

Lai, J. W. M., & Bower, M. (2020). Evaluation of technology use in education: Findings from a critical analysis of systematic literature reviews. *Journal of Computer Assisted Learning, 36*(3), 241–259. https://doi.org/10.1111/jcal.12412

Li, C., & Li, W. (2020). Learner identity in Chinese as a foreign/second language education: A critical review. *Frontiers of Education in China, 15*(1), 73–98. doi:10.1007/s11516-020-0004-x

Li, J., Antonenko, P. D., & Wang, J. (2019). Trends and issues in multimedia learning research in 1996–2016: A bibliometric analysis. *Educational Research Review, 28*, 100282. https://doi.org/10.1016/j.edurev.2019.100282

Martin, S., Lopez-Martin, E., Lopez-Rey, A., Cubillo, J., Moreno-Pulido, A., & Castro, M. (2018). Analysis of New Technology Trends in Education: 2010–2015. *IEEE Access, 6*, 36840–36848. https://doi.org/10.1109/ACCESS.2018.2851748

McMillan, J., & Schumacher, S. (2010). *Research in education evidence–based inquiry* (7th ed.). Boston: Pearson Education.

Natividad, G., Spector, J. M., & Evangelopoulos, N. (2018). Research Topics and Trends in Educational Technology. *In analysis of two decades of educational technology publications: who, what and where* (pp. 85–94). Springer-Verlag Singapore Pte Ltd. https://doi.org/10.1007/978-981-13-0137-7_5

Nurzhanov, C., Pidlisnyuk, V., Naizabayeva, L., & Satymbekov, M. (2021). Research and trends in computer science and educational technology during 2016–2020: Results of a content analysis. *World Journal on Educational Technology: Current Issues, 13*(1), 115–128. https://doi.org/10.18844/wjet.v13i1.5421

Oyelere, S. S., Bouali, N., Kaliisa, R., Obaido, G., Yunusa, A. A., & Jimoh, E. R. (2020). Exploring the trends of educational virtual reality games: a systematic review of empirical studies. *Smart Learning Environments, 7*(1), 31. https://doi.org/10.1186/s40561-020-00142-7

Quarterman, J., Pits, B. G., Jackson, E. N., Kim, K., & Kim, J. (2005). Statistical data analysis techniques employed in the Sport Marketing Quarterly 1992 to 2002. *Sport Marketing Quarterly, 14* (4), 227-238.

Rahmati, J., Izadpanah, S., & Shahnavaz, A. (2021). A meta-analysis on educational technology in English language teaching. *Language Testing in Asia, 11*(1), 7. https://doi.org/10.1186/s40468-021-00121-w

Scanlon, E. (2021). Educational Technology Research: Contexts, Complexity and Challenges. *Journal of Interactive Media in Education, 2021*(1), 1–12. https://doi.org/10.5334/jime.580

Schreiber, J. B., & Asner-Self, K. (2011). Educational research: The Interrelationship of questions, sampling, design, and analysis. New Jersey: John Wiley & Sons, Inc.

Shaikh, M. A. (2017). Study designs, use of statistical tests, and statistical analysis software choice in 2015: Results from two Pakistani monthly Medline indexed journals. *J Pak Med Assoc*, *67*(9), 1428-1431.

Skidmore, S. T., & Thompson, B. (2010). Statistical techniques used in published articles: A historical review of reviews. *Educational and Psychological Measurement, 70*(5), 777–795. https://doi.org/10.1177/0013164410379320

Turan, Z., & Akdag-Cimen, B. (2020). Flipped classroom in English language teaching: A systematic review. Computer *Assisted Language Learning, 33*(5–6), 590–606. https://doi.org/10.1080/09588221.2019.1584117

Yıldırım, A., & Şimşek, H. (2016). Qualitative research methods in the social sciences [*Sosyal bilimlerde nitel araştırma yöntemleri*]. Ankara: Seçkin Publishing.

Yildiz, E. P., Cengel, M., & Alkan, A. (2020). Current trends in education technologies research worldwide: Meta-analysis of studies between 2015-2020. *World Journal on Educational Technology: Current Issues, 12*(3), 192-206.

Yoo, J., & Kim, H. (2018). Analysis of qualitative research trends of educational technology in Korea. *Journal of Educational Technology, 34*(2), 309-344. Doi:10.17232/KSET.34.2.309