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Using Social Network Analysis to Review the Research in Open and Distance Learning

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Abstract

This study presents a social network analysis of the keywords attached to articles published in the Turkish Online Journal of Distance Education (TOJDE), a prominent journal in the field of open and distance learning. The social network analysis applied was based on a data mining and analytics approach. A total of 1120 keywords from 784 selected articles constituted the sample of the study. The keyword analysis revealed that the articles published in the TOJDE largely focused on technology-related issues, suggesting that the issues related to educational technology are a popular research area. However, the analysis also found that there was an imbalance between educational technology-related topics and pedagogy-related topics, a critical issue that needs to be further considered.

Introduction

For any discipline, it is important to understand the empirical evidence that has been gathered to realize its origin and future direction. Past experiences and empirical contributions are helpful in providing a sense of the continuum from the past to the present and the future. From this point of view, researchers in the field need to analyze and synthesize research trends to gain a better vision for future implications. Moreover, it is crucial to define the research areas of distance education and to fill the content of these areas with scholarly works and research-based evidence. Guided by this understanding, this paper aims to explore patterns by conducting a social network analysis of the keywords in articles published between 2000 and 2015.

According to Bozkurt and Akgun-Ozbek (2015), identifying research patterns is a critical task, insofar as these patterns can serve as a guide to researchers in the field. In this regard, much research has examined the scholarly landscape in the field of distance education from a global perspective (Amoozegar, Khodabandelou, & Ale Ebrahim, 2018; Berge & Mrozowski, 2001; Bozkurt et al., 2015; Çakiroğlu, Kokoç, Gökoğlu, Öztürk, & Erdoğdu, 2019; Hauser, 2013; Koble & Bunker, 1997; Lee, Driscoll, & Nelson, 2004; Orellana & Nethi, 2019; Rourke & Szabo, 2002; Tuncay & Uzunboylu, 2010; Wong, Zeng, & Ho, 2016; Zawacki-Richter & Naidu, 2016; Zawacki-Richter, Alturki, & Aldraiweesh, 2017; Zawacki-Richter, Bäcker, &Vogt, 2009; Weller, Jordan, DeVries, & Rolfe, 2018) as well as from local perspectives (Asdaque & Rizvi, 2019; Asdaque, Rizvi, Jumani, & Ahmed, 2018; Bozkurt et al., 2015; Durak et al., 2017; Gökmen et al., 2017; Horzum, Özkaya, Demirci, & Alpaslan, 2013; Panda, 1992; De Olivera Neto, & dos Santos, 2010; Ritzhaupt, Stewart, Smith, & Barron, 2010). To note, similar to the aim of this study, there have been two previous studies conducted that have analyzed the research trends in TOJDE. The overall objective of these other studies was to identify the research trends in TOJDE over a specific period.

In the first of these studies cited as being similar to the present, Latchem (2009) conducted a content analysis of the Notes for Editors and the articles published in the TOJDE between 2000 and 2008. The analysis involved determining the articles' countries of origin, the sectors represented, and the focus and frequency of the topics covered. It was reported that the majority of articles originated from Asian countries, with Turkey

providing the largest number of contributions. There were also many papers from the Middle East, Africa, South America, the USA, Eastern and Western Europe, and Australia. According to Latchem, some of the papers that presented non-Western perspectives were particularly illuminating. The earlier articles tended to be descriptive or theoretical, while more recent ones examined distance education and elearning needs, policies, procedures, practices and outcomes through a quantitative-experimental and qualitative-descriptive lens. The second of these two similar studies, which was conducted by Özarslan, Balaban-Sali and Demiray (2012), involved analysis of the articles in TOJDE published between 2000 and 2010, where the focus was on research topics, methods, instruments, statistical methods, author numbers and their institutional affiliation. They reported that single-author articles constituted the most substantial proportion of TOJDE articles. It was also indicated that Turkey, the USA, India, Nigeria, Malaysia, Pakistan, Australia, Canada, the UK, Bangladesh, Greece, and Iran, respectively, were the chief contributors to TOJDE. In addition, the researchers identified research topics covered in TOJDE articles. Accordingly, (1) Learner and instructor experiences in online learning environments; (2) information about the system and program; (3) the economic, social and cultural dimension of distance education, and (4) pedagogical, political, philosophical, legal, ethical reflections in distance education were the top four research topics addressed in TOJDE. In terms of method, it was found that quantitative studies far outweighed the qualitative and mixed studies. The study further revealed that document analysis was the most frequently used research instrument, which was followed by surveys, scales and interviews. In terms of data-analysis methods, descriptive statistics, content analysis, variance analysis and t-test were reported to be the most frequently used analysis methods.

Methodology

Research design

The present study is a review study that has aimed to examine (1) keywords of articles and (2) the publication network in cited references in articles published in the TOJDE. To conduct this review, social network analysis, a data mining and analytics approach, was applied to arrive at a synthesis.

Social Network analysis

Social network analysis provides a powerful way to map, summarize, and visualize networks and to identify critical nodes that occupy strategic locations and positions within the matrix of links (Hansen, Shneiderman, & Smith, 2010; Scott, 1988). In this research, a social network analysis was used to examine the patterns that emerge from the keywords in selected articles published in the TOJDE.

Sample: Articles published in TOJDE

TOJDE is an open access journal published by Anadolu University in Eskisehir, Turkey. For this study, all the articles published in the TOJDE between 2000 and 2015 were surveyed (N=784) (Table 1). Book reviews and editorials were excluded from the sample.

Table 1. Number of articles published per year in the TOJDE (Volumes 1-16)

Year	No. of issues	No. of articles	Year	No. of issues	No. of articles
2000	2	12	2008	4	54
2001	2	6	2009	4	57
2002	4	27	2010	4	51
2003	4	23	2011	4	71
2004	4	34	2012	4	90
2005	4	37	2013	4	93
2006	4	56	2014	4	75
2007	4	51	2015	4	47
Total					**784**

Limitations

First and foremost, since this study analyzed only those articles published in the TOJDE, it provides but a partial view. Hence, the findings derived from this study should be considered as complementary to those from other studies and be used for purposes of comparison and contrast. Second, though Open and Distance Learning (ODL) and Distance Education are terms similar in scope, they each have important unique features. However, throughout the research, these terms were used interchangeably due to the fact that their distinction was not so clear in the articles published in the TOJDE.

Findings

The analysis revealed there to be a total of 1120 keywords. The top 150 keywords with a minimum frequency of two are provided in Table 2. Descriptive statistics were used to provide insight into the current state of TOJDE publications.

Table 2. List of the most frequently used keywords in articles published in the TOJDE between 2000 and 2015.

#	Keyword	*f*	%	#	Keyword	*f*	%
1	Distance Education	175	15.6	76	Student	4	0.4
2	E-learning	75	6.7	77	Student Support Services	4	0.4
3	Distance Learning	45	4.0	78	Students	4	0.4
4	Online Learning	32	2.9	79	Teachers	4	0.4
5	Higher Education	28	2.5	80	Television	4	0.4
6	Blended Learning	22	2.0	81	Training	4	0.4
7	Internet	19	1.7	82	Virtual Classroom	4	0.4
8	Education	18	1.6	83	Adult Learners	3	0.3
9	Open And Distance Learning	22	2.0	84	Australia	3	0.3
10	Turkey	15	1.3	85	Blogging	3	0.3
11	Evaluation	14	1.3	86	Blogs	3	0.3
12	Learning	14	1.3	87	Challenges	3	0.3
13	Mobile Learning	19	1.7	88	Computer Anxiety	3	0.3
14	Technology	13	1.2	89	Cooperative Learning	3	0.3
15	Attitude	11	1.0	90	Critical Thinking	3	0.3
16	Online Education	11	1.0	91	Curriculum	3	0.3
17	Web 2.0	11	1.0	92	Digital Natives	3	0.3
18	Assessment	10	0.9	93	EFL Learning	3	0.3
19	Web-based Learning	10	0.9	94	Educational Technologies	3	0.3
20	Instructional Design	9	0.8	95	English Language Teaching	3	0.3
21	Teacher Training	9	0.8	96	Faculty	3	0.3
22	Interaction	8	0.7	97	Faculty Development	3	0.3
23	Learner Support	8	0.7	98	Flexible Learning	3	0.3
24	Multimedia	8	0.7	99	Gender	3	0.3
25	Online	8	0.7	100	Hellenic Open University	3	0.3
26	Professional Development	8	0.7	101	Individual Differences	3	0.3
27	Teacher Education	8	0.7	102	Information	3	0.3
28	Allama Iqbal Open University	7	0.6	103	Instructional Technology	3	0.3
29	Attitudes	7	0.6	104	Internet-based Education	3	0.3
30	Collaboration	7	0.6	105	Knowledge Management	3	0.3
31	Collaborative Learning	7	0.6	106	Language Learning	3	0.3
32	Globalization	7	0.6	107	Learning Environments	3	0.3
33	Learning Management System	7	0.6	108	Lifelong Learning	3	0.3
34	Learning Styles	7	0.6	109	Management	3	0.3
35	Open And Distance Education	7	0.6	110	Material	3	0.3
36	Perception	7	0.6	111	Mathematics Education	3	0.3
37	Anadolu University	6	0.5	112	Mobile	3	0.3
38	Blog	6	0.5	113	Nursing	3	0.3
39	Constructivism	6	0.5	114	Online Courses	3	0.3
40	Educational Technology	6	0.5	115	Online Instruction	3	0.3
41	Information Technology	6	0.5	116	Online Professional Development	3	0.3
42	Motivation	6	0.5	117	Pedagogy	3	0.3
43	Quality	6	0.5	118	Perceptions	3	0.3
44	Satisfaction	6	0.5	119	Physics Education	3	0.3
45	Student Satisfaction	6	0.5	120	Problem Solving	3	0.3
46	Academic Achievement	5	0.4	121	Quality Education	3	0.3
47	BOU	5	0.4	122	Science	3	0.3
48	Development	5	0.4	123	Skills	3	0.3
49	Distance Learners	5	0.4	124	Student Achievement	3	0.3
50	Facebook	5	0.4	125	Sustainability	3	0.3
51	Moodle	5	0.4	126	Teaching	3	0.3
52	Open Education Faculty	5	0.4	127	The Internet	3	0.3
53	Open Learning	5	0.4	128	Virtual Environments	3	0.3
54	Participation	5	0.4	129	Virtual Worlds	3	0.3
55	Social Networking	5	0.4	130	Web Based Learning	3	0.3
56	Teaching Practice	5	0.4	131	Web-based Education	3	0.3
57	Weblog	5	0.4	132	Women	3	0.3
58	Basic Psychological Needs Theory	4	0.4	133	Zimbabwe Open University	3	0.3
59	Blog And Social Network	4	0.4	134	AIOU	2	0.2
60	Certificate Program	4	0.4	135	Academic Performance	2	0.2
61	Communication	4	0.4	136	Access	2	0.2
62	Connectivism	4	0.4	137	Achievement	2	0.2
63	Culture	4	0.4	138	Achievement Motivation	2	0.2
64	Innovation	4	0.4	139	Adult Learning	2	0.2
65	Internet-based Learning	4	0.4	140	Africa	2	0.2
66	Learning Environment	4	0.4	141	Assignment	2	0.2
67	Malaysia	4	0.4	142	Assignments	2	0.2
68	Open Education	4	0.4	143	Audio	2	0.2
69	Physical Education	4	0.4	144	Awareness	2	0.2
70	Qualitative Research	4	0.4	145	B.Ed Programme	2	0.2
71	Second Life	4	0.4	146	Bangladesh	2	0.2
72	Self-efficacy	4	0.4	147	Barriers	2	0.2
73	Self-regulated Learning	4	0.4	148	Belief	2	0.2
74	Social Media	4	0.4	149	Benefits	2	0.2
75	Social Presence	4	0.4	150	Cognitive Load	2	0.2

For instance, in Table 2, it shows that following *Distance Education*, learning-oriented keywords (e.g., *elearning* [#2], *distance learning* [#3], *online learning* [#4], *blended learning* [#6], *open and distance learning* [#9], *mobile learning* [#13], *web-based learning* [#19], etc.) occupy the upper part of the list. Another interesting finding from the list is the institutional affiliations related to the territorial information used as keywords in reference to the physical context of the papers published in the TOJDE; these keywords include *Allama Iqbal Open University* (#28), *Anadolu University* (#37), *Hellenic Open University* (#100), and *Zimbabwe Open University* (#133), as well as the keywords referring to the country itself, such as *Turkey* (#10), *Malaysia* (#67), *Australia* (#84), *Africa* (#140), and *Bangladesh* (#146). Consistent with the observations made by Latchem (2009) and Özarslan, Balaban-Salı and Demiray (2012) in their studies, the descriptive information gives the impression that TOJDE is a local and global voice for the field, particularly for those from Asia and Africa.

In order to better understand the research patterns in the articles published in the TOJDE, a social network analysis based on keywords used in each article was conducted. In this research, keywords were identified as nodes, while their relationships, which were based on co-occurrence, were identified as ties. Of the 1120 keywords examined, a total of 130 that had a minimum co-occurrence of three were identified. From this identification, a visual of the keyword network was created. The network graph created represents 130 nodes with 499 ties among them. (Figure 1). The nodes in the network were grouped using the Clauset-Newman-Moore cluster algorithm, and the Grid layout algorithm was used to lay out the graph.

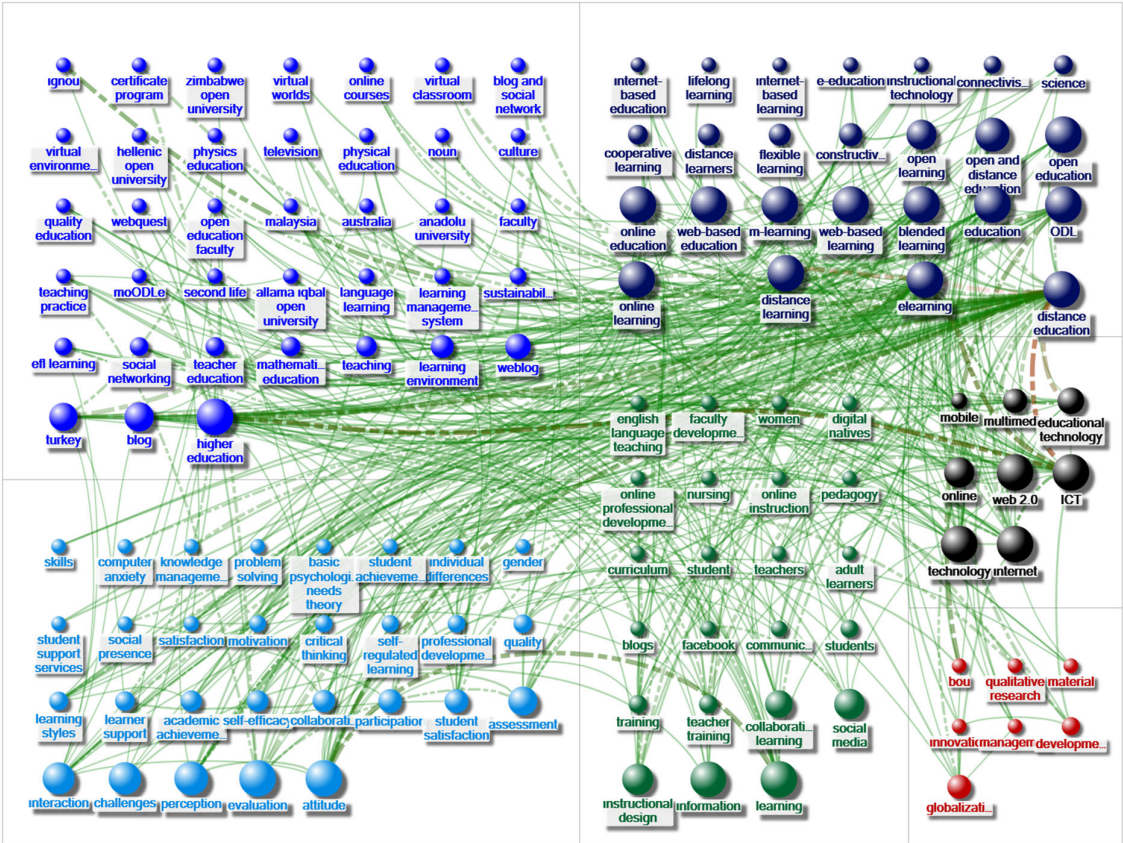

Figure 1. Social network analysis of the keywords used in the articles published in theTOJDE between 2000 and 2015

The analysis was based on betweenness centrality, which demonstrates both the bridging score of the nodes and their strategic position. Unsurprisingly, distance education emerged as the central node and was found to be strongly linked to elearning, higher education, Internet, distance learning, technology, ICT, and online learning (Table 3). One of the most salient findings from the social network analysis conducted was the tendency towards excessive dependency of distance education on "technology-based" practices (e.g., Internet, technology, and ICT) (see Figure 1 and Table 3).

Table 3. The nodes with high betweenness centrality scores

Node	Degree	Betweenness Centrality
Distance Education	81	3502.0
elearning	50	1442.2
Higher Education	28	564.2
Internet	22	391.0
Distance Learning	30	390.5
Technology	26	332.2
ICT	29	318.0
Online Learning	25	307.3

Following the investigation of the nodes, the ties among the nodes were examined according to their weights (Table 4). In confirmation of the results of the betweenness centrality analysis, the strongest relationship appeared to be between *distance education* and *elearning*. This was followed by *distance education* and *ICT,* which was expected considering the growing influence of technological developments and capacity increase due to the opportunities provided by ICTs. Similarly, *distance learning* and *elearning*; *distance education* and *educational technology*; *higher education* and *ICT,* and, lastly, *elearning* and *ICT* emerged as significant links. Overall, the weights of the links showed that distance education has established strong bonds with online practices and educational technology, with a focus on higher education.

Table 4. The relationship of the keywords with high weight scores.

Node 1	Node 2	Weight
Distance Education	eLearning	21.83
Distance Education	ICT	13.67
Distance Learning	elearning	10.67
Distance Education	Educational Technology	9.00
Higher Education	ICT	7.00
elearning	ICT	5.83

The findings from this study indicate that open and distance learning has evolved into a digital form, with a growing interest shown to online modes of delivery (see Table 3). This confirms earlier studies reporting that online learning, or elearning, has become the new normal for open and distance learning (Amoozegar, et al., 2018; Weller et al., 2018; Wong et al., 2016) and is in line with the study by Çakiroğlu et al.(2019), who claimed that "new pedagogical approaches and online learning designs have played a triggering role in research topics" (p. 1). Another interesting finding from this study is the strong relationship between ICT and distance education practices (see Table 4). This, as expected, stems from the accessibility opportunities provided by ICT (Çakiroğlu et al., 2019; Lee, 2017), which provides learners flexible, open, online learning options that help to facilitate and increase learners' independence and autonomy (Harasim, 2000; Canadian Council on Learning, 2009). While there have been many opportunities that have emerged with ICT, and these opportunities have led the way for online learning and elearning, Lee (2017) highlighted that pedagogic developments and technological development have not advanced in an equal manner. The findings from this study also partly confirm those reported by Lee (2017), insofar as they demonstrated that pedagogic keywords neither hold secondary positions (Table 2) nor have lower betweenness centrality metrics (Figure 1). This may derive from the marketing potentials of online learning / elearning practices (Harting & Erthal, 2005) and from the conflict between for- profit, commercial ambitions and the core values of open and distance learning (Evans & Pauling, 2010). However, it should be noted that the interpretation of these findings was derived from the analysis of only one journal and thereby provides only a partial view of the current state of open and distance learning. These findings should, therefore, be validated in future research.

Conclusions

With the aim of identifying patterns in the keyword network, this study examined articles published between 2000 and 2015 in the TOJDE. The findings show that TOJDE reflects research from local (e.g., Anadolu University) and global perspectives, where in the case of the latter, the focus is on specific characteristics of regional practices. This is thought to be promising in terms of providing diverse points of view and representing a territorially broad voice for this field.

Another intriguing finding from the study is the growing influence and dominance of technology-based practices. This is thought to be significant in terms of tracking trends in the field of distance education through regional journals such as TOJDE and of providing a complementary view by comparing results of similar studies. However, as discussed in the previous section, the pedagogical topics seem to be under the lure of technology-related research topics (e.g., ICT, elearning, online learning, etc.), a situation that could create a future bottleneck in the field.

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