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A theoretical framework on open and distance learning

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Abstract

Many studies have been carried out targeting Open and Distance Learning (ODL) and related fields. Thanks to the rapid development in technology, which can be a common ground for many fields, interdisciplinary studies among various fields have gained importance resulting in integration of different concepts both into ODL and other fields. With this in mind the purpose of this study is to investigate the main domains of ODL by categorizing research terms and issues, which may lead to a theoretical framework. In this study ten peer-reviewed journals were selected to investigate. 584 research articles published in these journals from 2009 to 2014 have been analyzed and categorized. According to the study, technology, pedagogy, theory, policy, accessibility, design, environment and management domains emerged. Also articles were analyzed for TF-IDF scores according to years and n-grams were created. The study concludes that although there have been many new and ongoing studies in the field of ODL, the field of ODL has been growing needing novelties in research, theory and application of ODL.

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1. Introduction

Open and Distance Learning (ODL) is relatively a new field with a historical background of nearly a hundred years. As Gunawardena & McIsaac (2003) states ODL has faced intense growth throughout the world since the early

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1980s and with the effect of technological advancements, its shape has rapidly changed from early correspondence education, in which primarily print based materials were mailed to learners at a distance to a learning process that can be accessed from anywhere at any time. Although many research and studies have been conducted on ODL, there is still need to propose theoretical frameworks. One of the reasons for this might be the fact that theoretical framework is not something that can be found readily available in the literature and rapid change in technology. Another reason is the fact that ODL has a close connection with technology and rapid changes in technology result in a necessary revision of theories, interactions, roles and content delivery methods related to ODL. It's clear that ODL is a field which needs a continuing revision and renewal mostly due to its related dynamics like technology. As McLuhan (cited in Anderson and Tron, 2011) first argued, technologies have an influence on usage, its definition and the pedagogy that was supported in the learning and design.

Theoretical frameworks are expected to reflect an understanding of theories and concepts that are related to a specific topic or field. As Herek (1995) states theoretical framework has the following advantages for a field or study:

- An explicit statement of theoretical assumptions permits the reader to evaluate them critically.
- The theoretical framework connects the researcher to existing knowledge. Guided by a relevant theory, you are given a basis for your hypotheses and choice of research methods.
- Articulating the theoretical assumptions of a research study forces you to address questions of why and how. It permits you to move from simply describing a phenomenon observed to generalizing about various aspects of that phenomenon.
- Having a theory helps you to identify the limits to those generalizations. A theoretical framework specifies which key variables influence a phenomenon of interest. It alerts you to examine how those key variables might differ and under what circumstances.

With this in mind, the purpose of this study is to investigate the main domains of ODL by categorising research terms and issues, which may lead to a theoretical framework.

2. Historical Background of ODL

Historical background of ODL can be categorized under pedagogy, technology and theory; however, it won't be wrong to state that these categories have strong interventions among each other.

2.1. Pedagogical Background of ODL

According to Anderson and Dron (2011), historically ODL has gone through three pedagogical approaches: Cognitive-behaviourism, social-constructivism and connectivism. They state that Cognitive-Behaviorist (CB) models defined the first generation of individualized distance education. Besides enabling large numbers of learners to get education at lower costs than traditional education, it also provided a maximum access and student freedom (Daniel, as cited in Anderson and Dron, 2011).

Cognitive-behaviorism and social-constructivism theories claim that learning occurs inside a person. Even social constructivist views, which hold that learning is a socially enacted process, promote the principality of the individual in learning. Connectivist approach focuses on learning process as well as what has been learnt. At the present time, in which open and distance learning resources or environments have gained popularity, the quality of the information learnt and the importance of converting the information into knowledge process has made connectivist approach more important for ODL.

When we look at the Social-Constructivist Pedagogy of ODL, Anderson and Dron (2011) urges that there exists a link between two-way communication technologies and social-constructivist pedagogy. This pedagogy category heavily focuses on interactions in between and among participants rather than just transmitting information.

With the recent developments in ICT and their effects on education has resulted in collaboration and virtualization of social environments. In this context, social relations and collaborative learning heavily relies on networks. Whereas in social-constructivist learning theory, actualization of learning is fulfilled with individual comprehension in a social manner, in connectivist theory it is fulfilled through recognition and interpretation of the structures distributed within the technologically advanced networks. According to George Siemens(2005),

Connectivism is the integration of principles explored by chaos, network, and complexity and self-organization theories. Learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual. Learning (defined as actionable knowledge) can reside outside of ourselves (within an organization or a database), is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing.

According to Vygotsky (1978), behaviourist, constructivist and cognitive theories have been used for structuring and maintaining learning processes. These theories regard learning as an internal process whereas social-constructivist theory explains learning and cognitive development as a social and collaborative activity. In his study, Vygotsky (1978) mentions two development levels: actual and potential developments. Actual development means the level which the learner reaches already and potential development means the level of learning which can be reached through the guidance of tutors or peer collaboration and potential development level is the stage at which planned learning occurs. Another point is that for a cognitive structuring to occur during the learning process, collaboration with others is important. As Shunk (2000) states reciprocal teaching, peer collaboration, cognitive apprenticeships, problem-based instruction, webquests, anchored instruction and other methods that involve learning with others are included in social constructivist approaches.

To sum up, it wouldn't be wrong to liken the structure of connectivism to human body in a win-win context: There exists a communication network which surrounds the individual and as the individual's learning grows, this affects the organizations and institutions around the individual and as their learning grows, this leads to an expansion in individual's learning. As Siemens (2005) states this knowledge development cycle enables learners to stay updated "in their field through the connections they formed".

2.2. Technological Background of ODL

Garrison (1985) categorises technological evolution of ODL under three generations: Correspondence, Telecommunications and Computer. Likewise, Anderson and Dron (2011) made a similar categorisation: Mass media, Conferencing and Web 2.0. When we look at the common criteria of these categorisation we can see that the type of interaction (one-way or two-way) and role of the participants (active or passive) plays an important role. Furthermore, as Gunawardena & McIsaac (2003) states while analysing today's and future distance learning technologies, it is crucial to consider "integrated telecommunication systems rather than simply video versus audio, versus data systems".

2.3. Theoretical Background of ODL

Keegan (cited in Simonson et. al., 1999) classified theories of distance education into three groups: theories of independence and autonomy, theories of industrialization of teaching, and theories of interaction and communication.

2.3.1. Theory of Independence and Autonomy

Wedemeyer, who proposes the theory of independence and autonomy, highlights that the core of ODL is learner independency and thus a (Simonson et al. 2009). Emphasising the characteristics of independent study systems such as separation and time, the earlier definitions of ODL can be said to be built on this theory. As Gunawardena and McIsaac(2003) states Wedemeyer's vision of independent study was consistent with self-directed learning and self-regulation.

2.3.2. Theory of Industrialization

Otto Peters' view of distance education was as an industrialised form of teaching and learning. He compared distance education with the industrial production of goods. He also claims that before the industrial age distance education couldn't have existed. From this aspect, Peters (1988) proposed a new terminology, which heavily highlights the concepts from industrialisation for the analysis of distance education: Rationalization, Division of Labor, Mechanization, Assembly Line, Mass Production, Preparatory Work, Planning, Organization, Scientific

control methods, Formalization, Standardization, Change of Function, Objectification, Concentration and Centralization. As Simonson et al. (2006) states, division of labor is the key element of distance education and with the help of "mechanization" and "automation", teaching process in Peters' theory has been updated.

2.3.3. *Theory of Interaction and Communication*

Borje Holmberg's theory of distance education, what he calls "guided didactic conversation", falls into the general category of communication theory (Schlosser & Simonson 2009, p.43). As Simonson et al. (2006) justifies, at first Holmberg proposed seven background assumptions and in 1995 these assumptions were extended. Accordingly, the theory consists of eight parts:

- 1.Distance education serves individual learners who cannot or do not want to make use of face-to-face teaching.
- 2.Distance education promotes students' freedom of choice and independence.
- 3.Society benefits from distance education.
- 4.Distance education is an instrument for recurrent and lifelong learning and for free access to learning opportunities and equity.
- 5.Distance education may inspire metacognitive approaches.
- 6.Distance education is based on deep learning as an individual activity
- 7.Distance education is open to behaviorist, cognitive, constructivist and other modes of learning.
- 8.Personal relations, study pleasure and empathy between students and those supporting them are central to learning in distance education.

All in all, Holmberg (1986) highlights that the dialogue between the learner and the teacher as the basic characteristic of distance education and states that guided conversation facilitates learning.

3. Methodology

What are the recent theoretical domains of Open and Distance Learning? was the main motive of the present study. With this question in mind, the present study is configured as a three-phase research: keyword search, categorization and content analysis.

Peer-reviewed journals in ERIC database were searched with the following key words: "distance education", "distance learning", "online learning" and "open and distance learning". The top ten journals, which include the highest number of publications in the field of distance education, were selected for the analysis. These journals are Distance Education, British Journal of Educational Technology, International Review of Research in Open and Distance Learning, Journal of Distance Education, Electronic Journal of e-Learning, Quarterly Review of Distance Education, American Journal of Distance Education, Journal of Asynchronous Learning Networks, Interactive Learning Environments, Open Learning: The Journal of Open, Distance and e-Learning. Since the purpose of this study is to identify the recent theoretical domains in ODL, the chosen journals are supposed to be qualified for the validity of the study. In these ten journals, 584 articles which were published between the years 2009 and 2014 and include ODL related research content are selected.

The key words and issues in the research questions of these article were analyzed and listed down in Google spreadsheet and were categorized under main themes. All the keywords were grouped under appropriate themes; however, sometimes some keywords had to be placed under different themes since they are difficult to be categorized under a certain theme.

Also using RapidMiner software, articles were analyzed. Using Tf-IDF analysis, key terms for each year were found.

4. Findings

The issues extracted from the research questions are put under the following main themes: Pedagogy, Theory, Research, Design, Policy, Technology, Environment, Learner and Teacher. The most intensive region of the node is found to be the pedagogy theme whereas the least intensive area of the node is found to be the research theme. Visual representations of connections were created and uploaded to website. The addresses are:

<http://goo.gl/eYoHWY>

<http://goo.gl/8ZnB9G>

<http://goo.gl/6sCR5f>

The term list calculated using tf-idf scores are shown in Table 1. The first 15 terms are given in order according to TF-IDF scores. In Wikipedia (“tf-idf,” 2014) tf-idf is explained as:

TF-idf, short for term frequency–inverse document frequency, is a numerical statistic that is intended to reflect how important a word is to a document in a collection or corpus. It is often used as a weighting factor in information retrieval and text mining. The tf-idf value increases proportionally to the number of times a word appears in the document, but is offset by the frequency of the word in the corpus, which helps to control for the fact that some words are generally more common than others.

Variations of the tf-idf weighting scheme are often used by search engines as a central tool in scoring and ranking a document's relevance given a user query. tf-idf can be successfully used for stop-words filtering in various subject fields including text summarization and classification.

Table 1. First 15 terms listed according to TF-IDF scores.

	2009	2010	2011	2012	2013	2014
1	learning	faculty	presence	learning	game	coursera
2	tutor	game	social_presence	students	mobile	dropout
3	residential	wiki	connectivism	mobile	educational_resources	blogs
4	learning_design	mobile	portfolio	online	presence	trade
5	medical	face-to-face	tutor	teachers	faculty	internet_self
6	immediacy	team	mobile	face-to-face	cognitive-load	cooperative
7	players	writing	cognitive_presence	instructor	teacher	deaf
8	reasoning	instructional_materials	satisfaction	presence	social_presence	interwise
9	retention	regulated_learning	language	facebook	blog	satisfaction
10	csl	satisfaction	emergent	course	training	teachers
11	competencies	virtual	screen	tutors	twitter	identities
12	transactional	instructor	team	learner	textbooks	self_efficacy
13	blog	service	faculty	virtual	virtual	enrolment
14	campus	learning_system	competencies	language	instructor	habits_behaviours
15	adoption	self_regulated	synchronous	group	face-to-face	supervisor

During the analysis also n-grams were created. In the fields of computational linguistics and probability, an n-gram is a contiguous sequence of n items from a given sequence of text or speech. The items can be phonemes, syllables, letters, words or base pairs according to the application. The n-grams typically are collected from a text or speech corpus.

An n-gram of size 1 is referred to as a "unigram"; size 2 is a "bigram" (or, less commonly, a "digram"); size 3 is a "trigram". Larger sizes are sometimes referred to by the value of n, e.g., "four-gram", "five-gram", and so on. We have created bigrams. In Table 2, there are bigrams of selected terms. The Google Document containing TF-IDF words and n-grams list is shared. The address of the document is <http://goo.gl/AoqDbd>.

Table 2. Chosen n-grams

Learning		Presence		Satisfaction	
1.	learning_design	1.	social_presence	1.	student_satisfaction
2.	blended_learning	2.	cognitive_presence	2.	satisfaction_levels
3.	learning_system	3.	teaching_presence	3.	assessing_satisfaction
4.	language_learning	4.	presence_online	4.	efficacy_satisfaction
5.	learning_style	5.	emotional_presence	5.	satisfaction_synchronous
6.	learning_resources	6.	omnipresence	6.	levels_satisfaction
7.	asynchronous_learning	7.	presence_concern	7.	satisfaction_amount
8.	interactive_learning	8.	presence_concomitant	8.	efficient_satisfactory
9.	learning_networks	9.	presence_confidence	9.	participants_satisfaction
10.	learning_environments	10.	presence_creation	10.	dissatisfaction

11.	learning_groups	11.	presence_impact	11.	satisfaction_learning
12.	collaborative_learning			12.	satisfaction_online
13.	active_learning			13.	effective_satisfactory
14.	online_learning			14.	interactions_satisfaction
15.	learning_experience			15.	overall_satisfaction
16.	group_learning				
17.					
18.					
19.					

In Fig.1

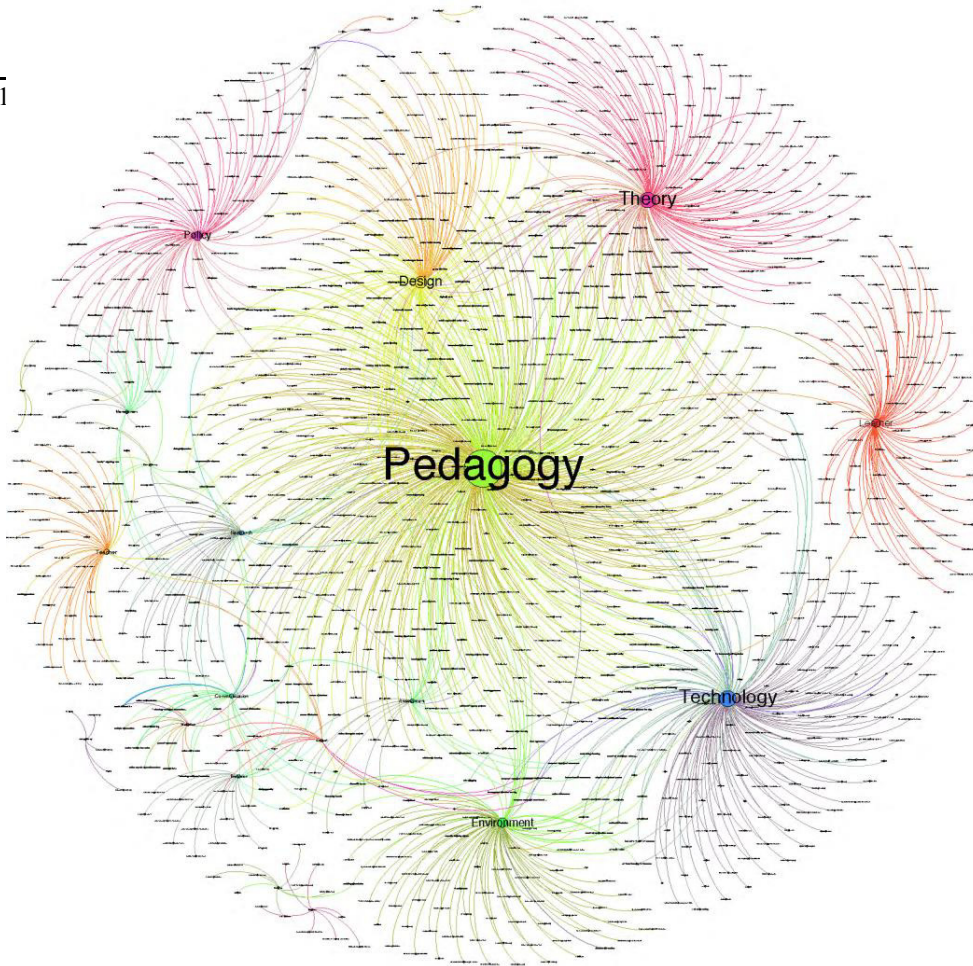


Figure 1. One of the created images of ODL.

Among the studied journals ‘Presence’ is a generally studied subject in 2010, 2012, and 2013 following an increasing trend. The subject generally studied in 2013. In our study we found these keywords and placed them under themes listed in Table 3.

Table 3. Presence

Keyword	Theme
emotional presence	Theory

instructor social presence	Teacher
learning presence	Theory
perceptions of social presence	Pedagogy
physical presence	Learner
presence	Theory/Pedagogy/Learner
teaching, social and cognitive presence	Pedagogy
virtual presence	Pedagogy

Among the studied journals ‘game’ is a generally studied subject in 2010, 2012, and 2013. The highest number of study on this subject was done in 2013. In our study we found these keywords and placed them under themes listed in Table 4.

Table 4. Game

Keyword □	Theme □
computer games	Technology
dialogue games	Theory/Technology
digital game-based learning	Technology/Theory
digital games	Technology/Theory
educational computer games	Pedagogy/Technology
educational game	Pedagogy/Design
educational simulation games	Pedagogy/Technology
game based learning	Theory
game-based course	Design
game-like learning systems	Technology
massively multiplayer online games	Environment/Technology
pre-algebra games	Environment
video game	Technology

Among the studied journals ‘game’ is a generally studied subject in 2010, 2011, 2012, and 2013. The highest number of study on this subject was done in 2013. There is an increasing trend in studies about mobile.

Table 5. Mobile

Keyword	Theme
mobile app design	Pedagogy
mobile augmented reality activity	Pedagogy/Design
mobile communication tools	Pedagogy/Technology
mobile device supported learning	Pedagogy/Design
mobile learning	Pedagogy/Design

5. Discussion and Conclusion

In the research articles between the years 2009 and 2014 in the field of ODL, learning, faculty, presence, game and coursera words have been found to have the highest TF-IDF scores, meaning that these words are more commonly used. Studying these researches and developments, while the trends between 2009 and 2012 show a similarity, as of 2012 there have been changes in the trends. Until 2012, whereas the scores of the theory and learning process related terms were higher, between 2012 and 2013 with the rise of some trends like social networks, MOOCs and gamification, game and coursera words constitute the top of the list. Considering the fact that approximately a nine-month time is required for an article to be published in a journal, it can be stated that starting from the beginning of 2012 there have been dramatic changes in ODL trends. Assuming that in educational

research, firstly applications are understood then their educational foundations and theoretical structures are studied, we can foresee that for the following years as well as MOOCs, mobile technologies, gamification, game based learning and social networks, theories related to them will emerge among the trends.

Though the TF-IDF scores between 2009 and 2014 have shown a difference, studies and research on face to face learning, presence, teacher and the learner, satisfaction, mobile and online learning have been conducted regularly. With the rise of connectivism and social networks, the studies carried out over wikis and blogs terms until 2011, have left their place to the terms facebook, game, mobile, twitter and coursera after 2012. Recently, high TF-IDF scores of the terms presence, cognitive load and dropout can be a proof that generally studies are done on the basis of connectivism. Having that said, besides being an important concept in the field of ODL in broader sense, presence is related with the activities of individuals during the distribution of knowledge. Another point is that cognitive load is related with information processing and in a connectivist structure information processing is fulfilled completely in self-structure. With the rise of MOOCs constructed on the basis of connectivism (cMOOCs), while studies on what the most preferred MOOC types are and how an effective MOOC can be designed are conducted, one of the seminal factors is the dropout rates. To sum up, it can be stated that connectivist approach exerts a great role in determining the latest trends in ODL. Considering the fact that connectivism first emerged in 2004, the reason why its effects on trends took 8-10 years can be explained by another fact that theories need some time to take root and in the field of education, theories result in radical changes on condition that appropriate technologies be used. Moreover, the rise in the score of habits and behaviors terms which haven't shown up on the top of ngrams has been an indication that with the changing learner and teacher roles, changes in habits and behaviours have been studied.

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