About the Journal

Journal of Educational Technology and Online Learning (JETOL) is an international, refereed, open access e-journal. The Journal targets both researchers and practitioners of educational technology and online learning fields. JETOL has been being published triannual, in January, May, and September. JETOL is currently indexed by Google Scholar, i2or, J-Gate, Eurasion Scientific Journal Index, Bielefeld Academic Search Engine (BASE), DRJI, ResearchBib, ROAD, Rootindexing, Index Copernicus, CiteFactor, COSMOS IF.

Editorial Board

Table of Contents

From the Editors

Dear JETOL readers,

We are proudly present the first volume, third issue of JETOL: Journal of Educational Technology and Online Learning. JETOL is a refereed, open access e-journal that disseminates original research, theory, and best practice on educational technology and online learning. We hope that JETOL will be a premier source for those who seek and pursuit knowledge. Therefore, we believe that we will a leading journal by the scientific contributions that will be made by you.

The first article, written by Soner Yaşar, is entitled "The Role of Massively Multiplayer Online Role-Playing Games in Extramural Second Language Learning: A Literature Review". The article deals with digital game-based language learning through a comprehensive literature review and provides suggestions for future research directions. The article highlights that playing MMORPGs in out-of-school contexts can stimulate and support second language development in a number of ways; however, just as it is biased and unfounded to disparage MMORPGs as merely superficial playthings, so is it to expect them to be instruments of L2 learning simply because they contain target language items.

The second article, written by Alaattin Parlakkılıç, is entitled "E-Learning Framework Design for Medical Education Based on Requirement Analysis". This study proposes an e-learning framework for Turkish Family Medicine (FM) physicians by requirement analysis using e-learning survey and program educators' interview. The main data collection was done with an online survey complemented by a structured interview. According to the outcomes of e-learning survey, the Khan framework was modified with Mobile/Wireless Technologies, Time, Content Control, Delivery Method dimensions. The program educators declared that their opinions for potential solutions as getting training for e-learning; increasing human resources capacity for support; implementing training in asynchronous format; accepting online learning culture; eliminating hardware, software and connection problems; increasing financial support; getting managerial implementation support and improving personal rights.

The Third article, written by Özer Çelik and Serthan Salih Altunaydin, is entitled "A Research on Machine Learning Methods and Its Applications". The article explains machine learning which was become important by the advent of innovative technologies such as artificial intelligence.

The fourth article, written by Nil Göksel, is entitled as ""Book Review: Media Rich Instruction-Connecting Curriculum to All Learners". The article evaluates the book edited by Rosemary Papa. The author suggests that the book as a must-see source addresses the existing learning and teaching needs within the context of e-learning theories and practices and, thus, gives concrete examples on educational technologies.

Yours respectfully,
Dr. Gürhan Durak
Dr. Aras Bozkurt
Editors in Chief

The Role Of Massively Multiplayer Online Role-Playing Games In Extramural Second Language Learning: A Literature Review

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Article Info	Abstract
	In recent years, digital game-based language learning has gained a considerable amount of recognition from researchers and educators alike. Emerging as one of the most popular digital game genres, massively multiplayer online role-playing games (MMORPGs) have been at the forefront of online gaming communities and their popularity has expanded to the pedagogical field of second language learning. While the relationship between online gaming and language acquisition is amply documented in various studies, these have mainly been in controlled and formal contexts (gaming sessions observed by a teacher/researcher in a classroom setting). Therefore, this literature review particularly focuses on the lesser-studied aspect of digital gaming; namely in extramural settings of digital engagement. Journal articles published within the last six years have been perused and five have been chosen as part of this overview, which does not aim at discussing the implementation of digital games into curricula but rather at drawing attention to common threads within the articles and to certain niches for improvement. The review shows that the sociocultural and collaborative nature of the gaming experience is an important factor in extramural L2 learning and that it should be studied exclusively. **Keywords**: *Digital game-based language learning, MMORPG, digital games, language learning*

1. INTRODUCTION

In a predominantly digital age, technological advancements have inevitably influenced almost all facades of life and the way we perceive it. The shift towards a globally online world has drawn the attention of educators, who have, over the years, deemed it necessary to be in tune with the Zeitgeist. The field of second language acquisition is especially witnessing an increasing interest in the potential of online games, namely network-based role-playing games as language learning environments (Achterbosch, Pierce and Simmons, 2008; Cornillie, Thorne and Desmet, 2012; Peterson, 2012; Strachan, Kongmee and Pickard, 2016; Sylvén and Sundqvist, 2012;). Although there have been a limited number of studies so far, massively multiplayer online role-playing games (MMORPGs hereafter) show promise in offering opportunities for language learners.

The main aim of this literature review is, first and foremost, to inquire what role(s) MMORPGs can play in supporting second language learning in extramural contexts by identifying and examining some of the recent studies conducted on the relationship between engaging in MMORPGs and second language development as well as discussing similar and differing themes found in key sources. To this end, this literature review firstly presents brief explanations of nomenclature related to digital games and progresses to introduce the major sources that will be used in this article. The contents of these sources will be summarised in the next part with a particular focus on determining and discussing the common points. The review will then move on to discuss whether there are certain competing views or niches for improvement among the chosen sources. Finally, the research question will be revisited and attempted to be answered.

2. TERMINOLOGY AND HISTORICAL BACKGROUND

Before explaining what MMORPGs are and what features they display, it would be beneficial to look at language learning through digital games retrospectively. The concept of technological innovations assisting language development dates back to the 1960s and late 1970s when the advent of personal computers (PCs) allowed wider audiences to experience and interact with this new medium. Since then, computer assisted language learning (CALL) has undergone several transformative phases that reflect the course of new technologies and paradigm shifts (Bax, 2003; Warschauer, 2000; Warschauer and Healey, 1998). Although there were a limited number of digital technologies and the Internet was still in its infancy in the early 1990s, the pedagogical potential of digital games was envisioned by Philip Hubbard, who argued that language learning based on digital games could not only be a reality but also a permanent fixture of curricula (Hubbard, 1991). Over the past few decades, the Internet, social media, 3D video games, mobile devices, networked game worlds and gaming communities have grown so exponentially and extensively that digital game-based language learning (DGBLL hereafter) has emerged as a "serious" entity for study amidst a fair amount of scepticism and reluctance from researchers (Chik, 2011; Neville, 2009; Selwyn, 2011). DGBLL is still a relatively new field and can be considered to be in a state of evolution where it necessitates an underlying theoretical framework.

Among the virtually endless array of digital games that are commercially available, possibly the one most accordant with second language learning in terms of collaborative activity, learner participation and knowledge construction would have to be MMORPGs, which comprise a unique category of commercial off-the-shelf (COTS hereafter) games (Van Eck, 2009) – games which are not explicitly designed with language learning or teaching objectives (Cornillie, Thorne and Desmet, 2012). Text-based MUDs (multi-user dungeons) and MOOs (multi-user domains object-orientated) are generally accepted as the ancestors of MMORPGs, which include three-dimensional, theme-based virtual realms where players from all around the world can interact with one another through customisable, user-controlled agents commonly known as avatars (Peterson, 2011). MMORPGs are distinctive in that they incorporate a narrative structure as the game adheres to a specific plot and a consistent game flow – avatars continue to "exist" in the virtual world even though players log out of the game (Achterbosch, Pierce and Simmons, 2008; Friedman, Hartshorne and VanFossen, 2008).

The main aim in MMORPGs is to develop players' characters within the game hierarchy by accepting and accomplishing specific tasks called quests, which, upon successful completion, add status or various skills to the player (Peterson, 2012). These quests become more difficult as the game progresses and need to be carried out in organized groups of players, namely guilds (Chen, 2015). Such in-game groupings allow inexperienced players or newcomers to communicate with more adept players by means of chat rooms or web forums, thus resulting in collaborative problem-solving activities and information sharing.

Of the multitude of MMORPGs currently available, Blizzard Entertainment's 2004 release *World of Warcraft* (*WoW* hereafter) deserves to be mentioned as one of the most popular and commercially successful examples of the genre, with more than one hundred million accounts having been created over the existence of the game (Polygon, 2014). In the virtual realm of *WoW,* it is possible to observe the typical features of MMORPGs: players controlling different classes and races of avatars in a fantasy setting to complete quests either on their own or in guilds, continuous sharing of information and expertise in chat channels and related forums, cooperative gameplay and social interaction based on problem-solving skills.

3. CURRENT RESEARCH ON MMORPGS FOR SECOND LANGUAGE LEARNING

In this section, several recent studies of digital games (MMORPGs) and second language learning are summarised chronologically, taking into account their underpinning theoretical and analytical methods. It should be noted that although there has been an increasing interest in the pedagogical benefits (especially concerning second language development) of digital games, it is still relatively uncharted territory and the potential of COTS digital games needs to be supported by the frameworks of second language acquisition.

Rama, Black, Van Es and Warschauer's (2012) qualitative study investigates the activities of two college-age Spanish learners in the Spanish version of the online game *WoW* over a period of seven weeks. The researchers aim to illustrate the ways in which the two learners benefit from the unique possibilities the combination of the game itself, its culture and the learners' skills present in terms of language learning (Rama et al., 2012). The study is essentially based on sociocultural theory and van Lier's (2000) concept of affordance is also adopted as a point of reference in the analysis, which initially focuses on language patterns in the participants' chat logs as well as themes in journal entries and interviews. Among the key affordances emerging from the study are the safe learning environment created by *WoW*, communicative competence highlighted in gameplay, and the promotion of collaborative activity between experts and beginners. The study does, however, acknowledge certain limitations that accompany the aforementioned affordances, especially emphasising the fact that there is a need for a "more structured approach" (Rama et al., 2012, p. 337) and that a preliminary tutorial about the mechanics of the game might prove beneficial both for players/learners and instructors.

Grounded on gaming as an extramural practice for the development of English as a second language, Sylvén and Sundqvist's (2012) study observes eighty-six young Swedish learners aged 11-12 asked to engage in seven different out-of-school activities, with digital games emerging as the most popular one. Given that the number of empirical studies investigating the relationship between the gaming tendencies of young learners and second language development is limited, Sylvén and Sundqvist put forward two research questions as their premise: one inquiring whether there is a positive correlation between the L2 proficiency of learners and their involvement in extramural English habits, and the other examining if a gender distinction exists in either of the previously mentioned areas. For this study, a questionnaire, a diary, and three proficiency tests are used as data sources, the results of which suggest a positive correlation between playing digital games and L2 proficiency. The researchers assume that digital games which contain a wide range of target language items and stimulating elements can enhance L2 proficiency (Sylvén and Sundqvist, 2012). Even though the findings of the study seem to corroborate such an assumption, variables, such as language aptitude, learning style or socioeconomic conditions are not taken into account; therefore, the need to explore these factors and to conduct longitudinal research for more substantial results is concluded.

Deviating slightly from previous studies by adopting a mixed-method approach (both quantitative and qualitative), Wu, Richard and Shaw's (2014) study examines MMORPGs as supplementary tools in assisting and developing English proficiency. To this end, nineteen adult volunteers from Taiwan and the United States are surveyed using Ryan and Deci's (2000) self-determination theory (SDT) – a framework on the psychological factors related to motivation – and Yee's (2006) components of motivation. The researchers primarily aim at investigating which aspect(s) of motivation the participants of the study view as promoting communicative competence and subsequently identify the sense of being in contact with other gamers or *relatedness* as the most prevalent component of motivation according to the SDT framework. Overall, the exploratory study recognises certain shortcomings it possesses –

ranging from the computers used to the disproportion of sexes in the study. Nevertheless, it bears some encouraging findings that point in the direction of the potential of MMORPGs being implemented in the "traditional" classroom as engaging and effective channels for second language learning provided that they are "properly scaffolded" (Wu, Richards and Saw, 2014, p. 80).

A more recent but rather small-scale study conducted by Strachan, Kongmee and Pickard (2016) explores the role(s) MMORPGs can play in second language learning processes and the player/learners' involvement with the target language during gameplay. A combination of ethnography and action research is employed as research methodology to study two Thai first year university students with disparate English levels and gaming experiences. A pre-test and post-test are administered during the case study to test vocabulary, grammar and listening skills. In addition, each participant is assigned various game-related tasks and data are collected in three phases: introducing basic game instructions, choosing suitable MMORPGs to play, and experiencing the game to transfer the information gained from earlier sessions. Both students select and engage in three different games matching their preferences while their tutor is also present in the gameplay as observer and helper. The results from the study show that MMORPGs can present opportunities for language learners not only to further their language skills but also to build up their linguistic competence in a relatively safe environment.

Scholz and Schulze's (2017) study is rather different from the other studies presented in this literature review in that German serves as the target language in the research. Furthermore, it calls for an approach that explores actual gameplay experiences instead of the self-reflection of the learners about the games; therefore, the researchers base their research methodology on complex adaptive systems (Larsen-Freeman and Cameron, 2008) and retrodictive qualitative modelling (Dörnyei, 2014) with the intention of gaining insight into how extramural digital gaming activities can foster L2 development. The study examines fourteen graduate and undergraduate students at a Canadian university over a period of four months as they are asked to engage in the German version of *WoW* for at least ten hours in their spare time. The research question posed for the analysis focuses on how the trajectories of language learners correspond to their trajectories of second language development. The researchers, after analysis of gathered data, claim that language gains from gaming experiences can be transferred and used successfully in other contexts, especially when these non-gaming situations are closely related to the in-game contents. It is also stated that second language development will be observed irrespective of the course of gameplay the learner takes (Scholz and Schulze, 2017).

4. COMMONALITIES IN KEY SOURCES

The aforementioned studies are an indication that MMORPGs have gained considerable attention from language researchers and that certain games display qualities which align with what second language acquisition theories deem essential for L2 learning. This section will aim at presenting and discussing some of the common threads that are salient in the preceding key sources.

MMORPGs are virtual worlds in which players interact with one another around a joint interest, share expertise and collaborate in problem-solving activities. Therefore, as is mentioned in Rama et al.'s (2012) study, these digital games have strong ties with sociocultural theory and Vygotsky's (1978) Zone of Proximal Development concept, where, put very briefly, the former views learning as a socially mediated activity and the latter emphasises the importance of novice-expert interplay in knowledge construction. In line with this thought, Sylvén and Sundqvist (2012) also correlate their research with the same theory

and concept, stating that MMORPGs, such as *WoW*, require their players to collaborate using in-game chats and web forums to accomplish tasks.

Another common thread that can be observed among the studies is the transferability of in-game skills and knowledge to other contexts. Despite scepticism from Thorne, Black and Sykes (2009), studies have shown that player/learners can put their gaming-related skills into practice in non-gaming settings (Scholz and Schulze, 2017; Strachan, Kongmee and Pickard, 2016; Sylvén and Sundqvist, 2012). Nevertheless, considering the specific nature and narrow range of lexicon present in MMORPGs as well as the informality of in-game chats, the language transfer to real-life situations can be said to be quite limited.

Undoubtedly, playing MMORPGs is a very popular form of recreational activity not only among teenagers but also among adults (Gee, 2007). Therefore, this volitional pastime is likely to be linked with a high level of motivation, which is a very essential component of second language learning (Dörnyei, 2001). In the studies of Sylvén and Sundqvist (2012), Wu, Richards and Saw (2014), and Strachan, Kongmee and Pickard (2016), the concept of motivation is addressed as an important aspect of gaming in that L2 learners display a "willingness to communicate" during gameplay, experiencing low levels of anxiety and gaining confidence in using the target language (Reinders and Wattana, 2014). However, the effects of being willing to communicate on second language acquisition still need to be further investigated.

5. NICHES FOR IMPROVEMENT

Although the implementation of computers in language learning is a well-established field, learning through digital games, especially MMORPGs, is relatively new and un(der)explored ground. Recent studies regarding the use of these games for second language learning are encouraging; however, they are mostly exploratory and heavily based on individual accounts.

One evident shortcoming among the studies in this literature review is the fact that there have not been many large-scale or longitudinal research projects investigating the relationship between engaging in MMORPGs and second language development. Thus, it has not been possible to reach a generalisation on the subject, and due to obvious restraints, such as limited play time or an uncustomary gaming setting (a classroom or a computer laboratory), the authenticity of the gaming experience itself seems highly questionable. Studies conducted extramurally (Rama et al., 2012; Scholz and Schulze, 2017; Sylvén and Sundqvist, 2012) have partially addressed the problem, allowing player/learners to play MMORPGs at their own discretion. That said, the observation of participants by researchers in this case is virtually impossible and the reliability of self-reporting can be disputable, rendering further investigation on how language learners can benefit from MMORPGs in extramural settings necessary.

Given the pace of evolution in COTS digital games, MMORPGs are becoming increasingly elaborate and challenging, which, at times, makes gaming an overwhelming experience even for experienced players. Although the studies in this literature review have included novice players and non-gamers as part of the research, Sylvén and Sundqvist, and Scholz and Schulze do not comment on whether the participants struggled with the game mechanics. In light of such accounts as being "confused by the game system" (Strachan, Kongmee and Pickard, 2016, p.104) or needing "more time getting accustomed to the play mechanics first" (Wu, Richards and Saw, 2014, p.76), it is apparent that there is a need for player/learner training to support and guide novice gamers in their gaming/learning experiences, thus enabling higher participation.

It should be noted that, with the exception of Sylvén and Sundqvist's study, none of the studies is aimed at young learners and it would be interesting to observe the effects of

MMORPGs on the interactions of young learners in a large-scale study. In addition, the majority of studies utilise only one MMORPG as part of their investigation (participants in the study of Strachan, Kongmee and Pickard are allowed to experience three different games); thus, another promising area of analysis would be the comparison of different MMORPGs and their impact on learner target language output.

6. CONCLUSION

This literature review set out to inquire what role(s), if any, MMORPGs can have in extramural second language learning and, to this end, five key sources as a research baseline were designated. Though the selected studies have different methodologies and perspectives, they all bear certain parallelisms that provide insight into this review.

In recent years it has become more and more evident that successful language learning is no longer restricted by the confines of the classroom mostly due to the ubiquity of digital technologies. It should come as no surprise that the discontent with the existing and rigid formal education models and with prescriptive teaching methods has coincided with the growing popularity of the Internet, social networking and digital games among young people. These "digital natives" have found refuge in out-of-school digital domains where they can engage in social and collaborative activities, and become active agents of their own learning experiences.

MMORPGs are immersive environments that not only offer entertaining and challenging fantasy worlds but also, more importantly, allow language learners to be creative and critical participants in knowledge sharing and problem-solving activities. As player/learners are represented by avatars in the games, the identities of individuals become anonymous, enabling learners to take risks in a relatively safe environment where the affective filter is lowered.

The studies discussed in this literature review show that MMORPGs present challenging tasks which require collaborative action (Rama et al., 2012) and that they provide opportunities for incidental second language learning in naturalistic settings (Sylvén and Sundqvist, 2012). In addition, the motivation component is predominant in playing MMORPGs (Wu, Richard and Shaw, 2014) as learners gain confidence in using their second language skills, which are transferable to the real world (Scholz and Schulze, 2017; Strachan, Kongmee and Pickard, 2016).

In light of the preceding findings, it is quite clear that playing MMORPGs in out-of-school contexts can stimulate and support second language development in a number of ways; however, just as it is biased and unfounded to disparage MMORPGs as merely superficial playthings, so is it to expect them to be instruments of L2 learning simply because they contain target language items. These games should not be perceived as a panacea for dysfunctional education systems or a revolutionary idea to be directly implemented in the classroom; rather, they ought to be examined more systematically to better understand the affordances they present and how they can be utilised as part of a curriculum that strives to bridge instructed classroom learning and extramural contexts.

- Researchers who plan to conduct Educational Technologies in biology education may benefit from the findings of the present study and make use of the dimensions examined in the present study.
- Conducting this study in an international scale and using multiple databases like "Web of Science" may yield further significant results by providing research sample diversity.
- With content analyses conducted on extensive sampling, various variables (country, language, article, thesis, etc.) can be compared.

- The results of the present study demonstrate that qualitative and mixed methods were least popular ones. Therefore, more qualitative research designs could be used to collect more in-depth data in the related field, and the mixed method, which takes advantages of the two methods (qualitative and quantitative methods) could be applied more.

Okul Dışı İkinci Dil Öğreniminde Devasa Çok Oyunculu
Çevrimiçi Rol Yapma Oyunlarının Rolü: Bir Literatür Taraması

Özet

Son yıllarda dijital oyun temelli dil öğrenimi hem araştırmacılardan hem de eğitimcilerden oldukça fazla ilgi görmüştür. En popüler dijital oyun türlerinden biri olan devasa çok oyunculu çevrimiçi rol yapma oyunları (MMORPG) genellikle çevrimiçi oyun topluluklarının ön sıralarında yer almıştır ve popüüleriteleri ikinci dil öğrenimi alanına kadar uzanmıştır. Çevrimiçi oyun oynama ile dil edinimi arasındaki ilişki çeşitli çalışmalarda fazlasıyla belgelenmiş olsa da bunlar genelde kontrollü ve kurum içi ortamlarda (bir öğretmen/gözetmen tarafından izlenen oyun seanslarının yürütüldüğü derslik ortamı) gerçekleşmiştir. Bu yüzden bu literatür taraması daha az incelenen bir alan olan okul dışında dijital oyun oynamaya odaklanmıştır. Son altı yılda konuyla ilgili olarak yayımlanmış makaleler taranmış ve beşi bu yazı için seçilmiştir. Bu tarama, dijital oyunların müfredatlarda yer almasını tartışmaktan ziyade taranan makalelerdeki ortak konulara ve geliştirilmeye açık olan bazı noktalara dikkat çekmeyi amaçlamıştır. Sözkonusu tarama göstermiştir ki okul dışı ikinci dil öğreniminde dijital oyun deneyiminin sosyokültürel ve iş birliğine dayanan doğası önemli bir faktördür ve daha ayrıntılı bir şekilde incelenmelidir.

Anahtar Kelimeler: Dijital oyun temelli dil öğrenimi, mmorpg, dijital oyunlar, dil öğrenimi.

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Soner Yaşar got his bachelor's degree from Haliç University, majoring in American Culture and Literature. He has translated books from English to Turkish and worked as a subtitle translator for TV channels. He has been teaching English at various language schools and giving private lessons while continuing his postgraduate studies in English Language Teaching (Distance Learning) at the University of East London. His interest areas vary from astronomy to Zen.

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E-Learning Framework Design For Medical Education Based On Requirement Analysis

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Article Info	Abstract
	This study proposes an e-learning framework for Turkish Family Medicine (FM) physicians by requirement analysis using e-learning survey and program educators' interview. The main data collection was done with an online survey complemented by a structured interview. According to the outcomes of e-learning survey, the Khan framework was modified with *Mobile/Wireless Technologies*, *Time, Content Control*, *Delivery Method dimensions*. The program educators declared that their opinions for potential solutions as getting training for e-learning; increasing human resources capacity for support; implementing training in asynchronous format; accepting online learning culture; eliminating hardware, software and connection problems; increasing financial support; getting managerial implementation support and improving personal rights. **Keywords**: E-learning framework, e-learning dimension, medical education, educator interview, family medicine physicians.

1. INTRODUCTION

Information and Communications Technology (ICT) has given way to adopt e-learning practices by providing tools to enhance learning and to improve institutional efficiencies (Chan & Ngai, 2007; Salimi, Shojaei & Raissi, 2015; Erol, 2015). Nichols (2007) and Sharma and Mishra (2007) mentioned e-learning in educational institutions as *on-site campus*, *blended learning* and *distance education*. Schichtel (2010) stated that technological advances will keep its traditional feature guaranteeing affective, pedagogic, and organizational support in education. Therefore, technological advances have opened new horizons for education in a reliable manner to support education (Khader et al., 2011; Rozano & Romero, 2016).

Family Medicine (FM) in Turkey started family practice as a new system for health care. In the new system family medicine physicians are responsible for patients and preventive services (Akdağ, 2016). The Minister of Health of Turkey announced that by March 2017 there had been 3,500 patients per one physician in Turkey. Heavy workloads may not give opportunities to family physicians to take continuing education. To solve the face-to-face education problems for Turkish FM physician, an e-learning framework which was designed according to the survey which was delivered online to Turkish FM physician. In this context this study proposes designing an e-learning framework in order to provide medical training and education online with a framework designed survey outcomes.

2. LITERATURE

Health professionals need to regularly update their knowledge of changes and advances in medical sciences, technologies and techniques. This activity is often called continuing professional education (CPE) or continuing medical education (CME). CME is usually acknowledged as an indispensable part of the working life of physicians and health professionals (Fordis, King,&Ballantyne, 2005).

In medical education, content can be delivered either synchronously or asynchronously. Synchronous delivery refers to real-time, instructor-led e-learning, where all learners receive information simultaneously and communicate directly with other learners. With asynchronous delivery, the transmission and receipt of information do not occur simultaneously. The learners are responsible for pacing their own self- instruction and learning. The instructor and learners communicate using e-mail or feedback technologies, but not in real time. Synchronous content delivery is hard to achieve in medical education without some preconditions needed such as high speed Internet connections, free access to computers and high computer skills of students and teachers (Masic, 2008).

An e-learning framework is a detailed digital tool to organize learning for desired learning outcomes (Vrabie, 2016). Designing an e-learning framework needs analysis and investigation of the resources (Khan, 2009; Akhondi, Yarmohammadian & Haghani, 2015; Tiyar & Khoshsima, 2015).

In order to solve e-learning problems, policy makers need to follow the current developments in the world to reach the highest standards and solutions (Baskan & Atalar, 2014). One of the way to find solutions is to devise a framework for applications. Frameworks do not only address the issue of e-learning integration with other teaching methods. But they provide e-learning systems development, applications and adoptions (Bradley, 2015; Kituyi&Tusubira, 2013; Ozdamli, 2013).

As a first structured e-learning framework Khan's e-learning framework aims to design an e-learning environment having eight dimensions which are pedagogical, technological, interface design, evaluation, management, resource support, ethical and institutional. Below are descriptions of the eight dimensions.

Pedagogical: This dimension addresses content analysis, audience analysis, goal analysis, design, methods and strategies of instruction. Upon unsuccessful cases it prescribe alternatives that combines elements of on-site and online instruction.

Technological: This dimension assesses the hardware, software, and infrastructure planning. It addresses the most suitable learning management system (LMS) and communication tools to reach goals and objectives.

Interface: This dimension addresses pertain to the overall look and feel of an e-learning course related with web design, content design, navigation, accessibility, and usability testing.

Evaluation: This dimension addresses the assessment of learners, learning environment, content development processes, instructional design processes of the program.

Management: This dimension is used for the continuation, updating, and upkeep of the learning environment. Controlling the e-learning system for performance is aimed in order to sustain quality control, budgeting, staffing, security, and scheduling.

Resource Support: This dimension deals with the technical and human resources support to create successful online learning environments.

Ethical: This dimension relates with issues like social and political influence, diversity, bias, the digital divide, information accessibility, etiquette, and legal issues such as privacy, plagiarism and copyright.

Institutional: This dimension addresses issues of administrative affairs, academic affairs and student services. Before an online program is launched, each of the these issues should be solved for a smooth implementation (Khan, 2011).

- When we explored up-to-date e-learning frameworks, we found that The Society of Teachers of Family Medicine (STFM)   has been researching and testing several e-learning frameworks. STFM is an association of nearly 5,000 innovative family medicine educators. These teachers include medical school professors, preceptors, residency program faculty, residency program directors and others involved in family medicine education. During the study a close research relation and collaboration was done with STFM e-learning staff. And useful information and implementation clues were derived from their experiences.

STFM needs were very specific, a lot of time was spent weighing the pros and cons of each system relative to how closely they met those needs. Their first realization was that no LMS would ever be perfect. Finally, they chose Docebo which offers a dynamic catalog with a high "ease of use" factor. It is also compatible with the latest editions of the SCORM standard, which is necessary for tracking quizzes and saving a user's information. Key issues for choosing an e-learning system for STFM **:**

Mobile friendly. The users were considered first. Because physicians are incredibly busy, want to give priority to mobile use.

Reporting. No reporting system is perfect. LMSs come with standardized reporting. This means that what is important to us is not necessarily important to the LMS provider. STFM is working with Docebo to develop custom reporting at additional cost.

Accessible Catalog. It was also important to us that our catalog be visible on website. This was an issue with most LMSs, since everything is hosted on their servers.

Modularity. The courses should be structured in modules that can be handled independently and be components of a course.

In doing the research on e-learning framework the level of tracking, mobile use of the system, modularity and user licenses were seen important from STFM experiences.

3. METHODOLOGY

In this study data collection was performed using quantitative and qualitative methods separately. A survey was used for main data collection and a structured interview was done to get program educators opinions.

Participants
Turkish Family Medicine (FM) physicians were main participants. Participation was based on volunteerism. Participants were informed with e-mails and the survey was done online.

The Survey
The survey instrument was developed to gain as much information as possible for the family medicine (FM) physicians in Turkey. The survey was divided into demographics, communication issues and e-learning parts. Question analysis of the Survey Instrument was performed by the experts who have been providing training and consulting to the Turkish FM physicians in Biostatistics and Medical Informatics Department of Yıldırım Bayezit University in Ankara-Turkey. The survey questions were analyzed and updated. Thereafter the survey was pilot tested before used for data collection.

The content and construct validity of the survey instrument according to Cronbach's Alpha analysis was found overall to be high consistency (Cronbach alfa=0.72 Table 2). A five-point

Likert scale was used to get responses ranging from 1 being "strongly disagree", 2 "disagree", 3 "neutral", 4 "agree", and 5 "strongly agree".

The Interview

The interview was done to investigate the opinions and critical factors of educators to implement e-learning. The interview was done to discover the coherency of program educators statements and to support the online survey. Program educators were invited to participate in the interview. Six educators participated in interview: 4 male and 2 females. The interview was conducted at the Yıldırım Bayezit University in their office, and the discussion lasted 3 hour totally. After the interview, coding, analyzing, commenting, labeling, highlighting, and grouping the key facts were done. Findings were written and were examined. It was conducted in three steps:

- Interview procedure development
- Recognize the opinions of educators
- Identifying critical factors and potential barriers.

4. FINDINGS AND DISCUSSIONS

An online survey was performed by 1055 Turkish FM Physicians. The results show that four new dimensions (*Mobile/Wireless Technologies*, *Time*, *Content Control*, *Delivery Method)* were found in addition to Khan's e-learning framework dimensions (Pedagogical, Ethical, Evaluation, Technological, Interface Design, Institutional, Management, Resources Support). In the study the e-learning framework dimensions findings were evaluated as follows:

Mobile/Wireless Technology. Mobile/Wireless technologies open new windows and opportunities for education improvement and redesigns the organizational and educational settings (Uzunboylu & Tugun, 2016). In the study It was determined that 92,6 % of physicians have at work internet connection and 82,4 % of physicians have at home internet connection. And also %55,2 have mobile internet connection, %19,1 have Wi-Fi internet connection. This means that family physicians have enough internet connection for e-learning readiness and mobile technology must be considere while designing e-learning framework (Kocakoyun & Bicen, 2017) since it facilitate visualization (Tong & Bakan, 2016).

Time. Time refers the users' eager to devote time to use the required innovation (Idrus 2008). In the study the participants declared that they spend 30-60 minutes daily for e-learning by 58.25%.

Content Control. Students utilize the different learning styles interchangeably during the learning process in order to have an effective learning experience. In the study the participants declared that they want to have control over teaching materials by 76.38% and want to have discussions with teachers and others by 67.54 %.

Delivery Method. In medical education content can be delivered either synchronously or asynchronously. In this regard, 82 % of participants think e-learning should be asynchronous because it is difficult to manage and teach for large number of participants for synchronous implementation.

Technology. In the study 84.47% of participants have home internet connection, 95.05% have working place connection and 55.24 % have mobile internet access. This shows us that Turkish Family medicine doctors have enough internet access technology both in their working posts and in their daily life.

Interface Design. The interface design is a very important element because it could be the way to the success, or failure of any framework. In the study for interface design, participants agreed on good and effective design by 84.53 %.

Institutional. In the study the participants declared that lack of legal provision on intellectual property has hindered the development of e-learning by 16.66%. They need a central agency to control and make policy are required by 61.51 %.

Resources Support. The results show that the level of *resources support* was 65.86%. Participants declared that the organizational vision is moderate 50.14 % and middle level managers have positive attitudes of 68.5% for technology and innovation.

Management. The management of e-learning refers to the maintenance of the learning environment and distribution of information and lack of ongoing support from management, failure to perform meaningful reviews to ensure an environment of continuous process improvement, etc. (Idrus, 2008).The participants declared that institution should create a budget by 74.68% and give mobile and portable devices by 68.43%.

Pedagogical. The technology effects teaching and learning. It depends on integration with curriculum and instruction (Bielefeldt, 2006). The importance of *Pedagogical was* ranked by 64.22%.

Ethical. The participants declared that they can share in e-learning environment by 76.35%, and the e-learning acceptation rate was 59.40%.

Evaluation. The evaluation should be done for both the instruction and learning environment. The participants declared by 87.31% that evaluation regularly should be done.

Interviews

By analyzing interviews, it was seen that all participants had positive attitudes about the possibility of implementing e-learning in family medicine. Almost all educators believed that e-learning allows people to access economically and exchange information effectively and efficiently for research and development. The other opinions are as follows:

- *Technical knowledge:* The educators need to take e-learning and course design training.
- *Human resources:* In general, the levels of qualifications were satisfactory across Turkish FM program educators. However, in order to deploy successful e-learning, the human resources capacity should be developed.
- *Attitude.* Overall, educators reported that family medicine physicians were enthusiastic about technology. They have claimed that asynchronous course format is more appropriate than others. Because of heavy workloads, physicians study at home or wherever, whenever it is convenient.
- *Culture.* Educators believed that before developing and implementing e-learning, it is important to encourage the acceptance of an online culture throughout Turkish FM. They believe that it is important to be less formal. It is necessary to encourage self-awareness to change the conventional method to e-learning habits.
- *Equipment and infrastructure:* Educators say that they have no infrastructure and internet connection problems. A special department should be established for planning, designing and implementing e-learning.
- *Financial support:* Educators say that for effective implementation, physicians' salaries should be increased and financial support should be given for development and modern systems, as well.
- *Management support:* Educators say that they have upper level support from their managers. They want written and executable rules and regulations about working system and personal rights.

Barriers to e-learning implementation. Educators declared several barriers. They say that some are curable, but need time. These barriers are as follows:

- Inadequate knowledge about e-learning systems,
- Need for more modern equipment/hardware/software,

- Lack of human resources,
- Internet connection/capacity/speed,
- Lack of financial support for development,
- Resistant to using technology,
- Unwillingness to be involved in an e-learning environment,
- Huge number of family medicine phyisicians,
- Need for written regulations.

Depending on the outcomes of both the e-learning survey and educators' interview, it was required to add *Mobile/Wireless Technologies*, *Time, Content Control*, *Delivery Method dimensions* to Khan's Framework in order to propose an e-learning framework for Turkish FM Physicians.

5. CONCLUSION AND SUGGESTIONS

After the study, it was seen that it is wise to add *Mobile/Wireless Technologies*, *Time, Content Control*, *Delivery Method dimensions* to Khan's Framework for proposing an e-learning framework for Turkish FM physicians' medical education. According to the result of interview, the program educators require a training need for e-learning, need to develop human resources capacity for assistance and personal support, implement training in asynchronous format, encourage the acceptance of online learning culture, eliminate equipment and infrastructure and Internet connection problems, give more financial support to develop modern systems, and get support from managers.

İhtiyaç Analizine Dayalı Tıp Eğitimi İçin E-Öğrenim Çerçevesi Tasarımı

ÖZET

Bu çalışma, e-öğrenme anketi ve program eğitmenleri ile görüşme yöntemlerini kullanarak ihtiyaç analizine dayalı Türk Aile Hekimliği (FM) hekimleri için bir e-öğrenme çerçevesi önermektedir. Veri toplama, yapılandırılmış bir görüşme ile tamamlanan çevrimiçi bir anket ile yapıldı. E-öğrenme anketinin sonuçlarına göre, Khan Çerçevesi Mobil / Kablosuz Teknolojiler, Zaman, İçerik Denetimi, Teslim Yöntemi boyutları ile geliştirildi. Program eğitmenleri, e-öğrenme için eğitim almak, potansiyel; destek için insan kaynakları kapasitesinin artırılması; eşzamansız formatta eğitim uygulamak; çevrimiçi öğrenme kültürünü kabul etmek; donanım, yazılım ve bağlantı sorunlarını ortadan kaldırmak; artan finansal destek; yönetsel uygulama desteği almak ve kişisel hakları geliştirmek. çözümlere yönelik görüşlerini beyan ettiler.

Anahtar Kelimeler: E-öğrenme çerçevesi, e-öğrenme boyutu, tıp eğitimi, eğitimci görüşmesi, aile hekimliği hekimleri.

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A Research on Machine Learning Methods and Its Applications

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Article Info	Abstract
	Machine learning is a science which was found and developed as a subfield of artificial intelligence in the 1950s. The first steps of machine learning goes back to the 1950s but there were no significant researches and developments on this science. However, in the 1990s, the researches on this field restarted, developed and have reached to this day. It is a science that will improve more in the future. The reason behind this development is the difficulty of analysing and processing the rapidly increasing data. Machine learning is based on the principle of finding the best model for the new data among the previous data thanks to this increasing data. Therefore, machine learning researches will go on in parallel with the increasing data. This research includes the history of machine learning, the methods used in machine learning, its application fields, and the researches on this field. The aim of this study is to transmit the knowledge on machine learning, which has become very popular nowadays, and its applications to the researchers. **Keywords**: Machine Learning, Machine Learning Algorithms, Artificial Intelligence, Big Data**.**

1. INTRODUCTION

Learning is defined as "the process of a change and enhancement in the behaviours through exploring new information in time" by Simon. When the "learning" in this definition is performed by the machines, it is called machine learning. The term enhancement is creating the best solution based on the existing experiences and samples during machine learning process (Sırmaçek, 2007). As a result of the developments in information technologies, the term 'big data' has emerged. The term 'big data' is not a new concept and can be defined as enormous and accumulating raw data sets which have no limits and cannot be analysed by the traditional database techniques (Altunışık, 2015). Enormous data are collected from the Internet applications, ATMs, credit card swiping machines and etc. The information collected by this way is waiting to be analysed. The aim of analysing the data collected in different fields change in accordance with the business sector. Machine learning applications are used in some fields like natural language processing, image processing and computer vision, speech and handwriting recognition, automotive, aviation, production, generation of energy, calculated finance and biology. However, the aim is based on the principle of analysing and interpretation of the previous data. As it is impossible to analyse and interpret by human, machine learning methods and algorithms have been developed to do this (Amasyalı, 2008).

In this study, the concept of machine learning, which has become very popular recently, is examined in detail. The study includes information about the history of machine learning, the methods and algorithms used and its application areas. The final part is a conclusion which consists of the results of the previous studies.

2. MACHINE LEARNING

2.1. Definition
There is no error margin in the operations carried out by computers based an algorithm and the operation follows certain steps. Different from the commands which are written to have an output based on an input, there are some situations when the computers make decisions based upon the present sample data. In those situations, computers may make mistakes just like people in the decision-making process. That is, machine learning is the process of equipping the computers with the ability to learn by using the data and experience like a human brain (Gör, 2014).

The main aim of machine learning is to create models which can train themselves to improve, perceive the complex patterns, and find solutions to the new problems by using the previous data (Tantuğ ve Türkmenoğlu, 2015).

2.2. History
In 1940s, based on the studies on the electrical crashes of the neurons, the scientists explained the decision-making mechanism of human by cannon and fire. In this way, the researches of the artificial intelligence started in the 1950s (Erdem, 2014). In those years, Alan Turin executed the Turing Test in order to test the ability of a machine to imitate a human. The aim of the Turing Test was to measure the ability of the machine to make a contact with a human during an interview. If the machine performed worse than a human, it was successful. In 1956, the term 'artificial intelligence' was first used in a summer school held by Marvin Minsky from Massachusetts Institute of Technology, John McCarthy from Stanford University and Allen Newell and Herbert Simon from Carnegie-Mellon University. Until that time, Alan Turing's term, 'machine intelligence', had been used. In 1959, Arthur Samul created the checkers programme, and then machine learning got its way. From those developments to the 1980s, there were some studies on abstract mind, information-based systems, which was called the 'winter of artificial intelligence'. In the 1990s, artificial intelligence and machine learning studies accelerated due to the developments in game technologies. Nowadays, artificial intelligence and machine learning are used in lots of researches and work sectors (Topal, 2017)

2.3. Machine Learning Methods
Machine Learning can be examined in four parts as follows;
- Supervised learning
- Unsupervised learning
- Semi-supervised learning
- Reinforced learning

Supervised Learning: It is a method in which the present input data is used to reach the result set. There are two types of supervised learning: classification and regression supervised learning.
- Classification: Distributing the data into the categories defined on the data set according to their specific features.
- Regression: Predicting or concluding the other features of the data based on its some available features.

Unsupervised Learning: The difference between the supervised and unsupervised learning is that in unsupervised learning the output data is not given. The learning process occurs by using the relations and connections between the data. Also, unsupervised learning doesn't have a training data.

There are also two types of unsupervised learning: clustering and association.

- Clustering: Finding the groupings of data which are similar to each other when inherent groupings in the data is not known.
- Association: Determining the relations and connections among the data in the same data set.

Deduction of Features: In some cases, although lots of features about the data are known, the features related to group and category of the data cannot be determined. In such cases, selecting a subgroup of features or getting new features combining the features is called deduction of features (Erdem, 2014).

Semi-supervised Learning: supervised and unsupervised learning is inadequate when the labelled data are less than unlabelled data. In such cases, the unlabelled data, which are very inadequate, is used to deduce information about them. And, this method is called semi-supervised learning. The difference between the semi-supervised learning and the supervised learning is the labelled data set. In supervised learning, the labelled data are more than the data to be predicted. In contrast, in semi-supervised learning, the labelled data are less than the data to be predicted (Kızılkaya ve Oğuzlar, 2018).

Reinforcement Learning: This is a kind of learning in which the agents learn via reward system. Although there is a start and finish points, the aim of the agent is to use the shortest and the correct ways to reach the goal. When the agent goes through the correct ways, s/he is given positive rewards. But the going through wrong ways means negative rewards. Learning occurs on the way to the goal (Sırmaçek, 2007).

2.4. Machine Learning Algorithms
2.4.1. Artificial Neural Networks
Artificial neural network is a data processing system which is developed based on the biological neural networks in the human brain to function like human brain neural networks (Kocadayı, Erkaymaz, ve Uzun, 2017).

Neurons (process elements) are the basics of artificial neural networks. Neurons have 5 basic functions: inputs, weights, summation function, activation function and output.
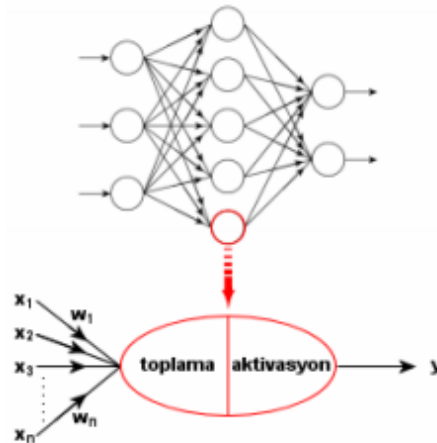

Figure 2.1. The structure of artificial neuron

Inputs (x_1, x_2, …, x_n): It is the layer created by the user with the samples in the data set.
Weight (w_1, w_2, ..., w_n): It shows how much of the input data would reach the output. For example; w1 weight shows how much the x1 input would affect the output. The values of the weights can be changeable, which doesn't mean that the inputs are important or unimportant.
Summation Function: This is the function which is used to calculate the total input in a cell. Various functions are used during calculation. These functions are explained in the following table:

Table 2.1. The summation functions used in artificial neural networks

Name of the function	Function	Explanation
Weighted total	$NET = \sum x_i . w_i$	Inputs and weight values are multiplied. The calculated values are added to each other.
Multiplication	$NET = \prod x_i . w_i$	Inputs and weight values are multiplied. The calculated values are multiplied.
Maximum	$NET = Max(x_i . w_i)$	Inputs and weight values are multiplied. The highest calculated value is taken.
Minimum	$NET = Min(x_i . w_i)$	Inputs and weight values are multiplied. The lowest calculated value is taken.
Incremental total	$NET_k = NET_{k-1} + \sum x_i . w_i$	Weighted total is calculated. The previous weighted total is calculated.

Activation Function: This function is used to calculate the output value which corresponds the input value. In some neural network models, it is must for the activation function to be derivable. Calculating the derivative is important for the learning process of the network. Thus, the derivation of the sigmoid function is the most commonly used function because it can be written in the function itself. It is not compulsory to use the same activation function in all the cells. They can have different activation functions. Activation functions are as follows: linear function, sigmoid function, hyperbolic tangent function, sine function, digit function.

Output: This is the value which is determined by the activation value. The last output produced can both be sent to the other cells or to the outer world. If there is a feedback, the cell may use the output as an input by this feedback (Haciefendioğlu, 2012).

2.4.1.1. Single Layer and Multilayer Artificial Neural Networks
The first researches on artificial intelligence started with the single layer artificial neural networks. The most important feature of the network is classification of the problems which can be selected linear as a layer. After the inputs in the problem are multiplied by the weights and added, the calculated values are classified according to their threshold value as high or low. The groups are shown like -1 and 1 or 0 and 1. During the learning process, both the weights and the weights of threshold value are updated. The output value of the threshold value is 1. Since the single layer artificial neural networks are inefficient for the nonlinear problems, multilayer artificial neural networks have been developed. Today, mostly used artificial neural network is the multilayer artificial neural network. Multilayer networks emerged during the studies to solve the XOR problems. Multilayer networks have 3 layers.

Input Layer: This layer gets the information from the outer world, but there is no process on this layer.

Interlayers: The information from the input layer is processed on this layer. Mostly one interlayer can be adequate for the solution of the problem. However, if the relations between input and output are not linear or there are some complications, more than one layer can be used.

Output Layer: The information from the interlayer is processed on this layer and the outputs which correspond the input are detected.

In training the multilayer artificial neural networks, the 'delta rule' is used. As the multilayer networks use supervised learning methods, both the inputs and the outputs which correspond the inputs are shown to the network. According to the learning rule, the error margin between the outputs and the expected outputs are distributed to the network in order to minimize the error margin (Öztemel, (2003).

2.4.1.2. Feedforward and back propagation artificial neural networks
Artificial neural network architectures are divided into two groups as feedforward and back propagation based on the directions of the links between the neurons. In the feedforward networks, the signals go from input layer to output layer on the one-way links. At the same time, in the feedforward networks, the output values of the cells in one layer are transmitted to the following layers as the inputs on the weights. The input layer sends the input to the hidden layer without making any change. Once this information is processed on the hidden and the output layer, its output on the network is determined. Multilayer sensors and learning vector quantity can be examples of feedforward artificial networks.

The most important characteristics of the back propagation artificial neural networks is that output value of at least one cell is given to itself or another cell as an input value. The back propagation can be processed on a retardation unit as well as the cells in one layer or among the cells on other layers. Because of this feature, the back propagation artificial neural networks show a dynamic behaviour [12]. Those networks got their name by their function that they can organize the   weights backwards in order to minimize the errors occurred on the output layer (Hamzaçebi ve Kutay, 2004).

2.4.2. Decision Trees
A decision tree which learns from the data classified by the induction is a decision making structure. It is a kind of learning algorithm which divides the large amount of data into small portions by using simple decision making steps. At the end of every successful division, the similarity of the elements in the final group increases. The decision trees, which have descriptive and predictive features, are one of the most popular classification algorithms because they can be easily interpreted, integrated to the databases and are reliable (Albayrak ve Yılmaz Koltan, 2009). Decision tree have three structures: decision nodes, branches and leaves.

Root Nodes: It is a node which has no former branch and can create one or more branch. Root nodes show the dependent variable and show which variable will be used for the classification.

Interior Node: It is a node which has one incoming branch and can have two or more outgoing branches.

Leaf or Terminal nodes: These are the nodes which has an incoming branch but no outgoing brand.

This is a structure which shows the result of the test between the leaves and the nodes, and has a role to determine the groups to be defined. If the classification is not completed at the end of the branch, a decision node emerges. The place of the nodes at the end of every branch is called deepness. The user can determine the number of deepness by analysing the appropriateness of the decision tree to the data set. In the decision trees, the deepth and the number of groups are directly proportional.
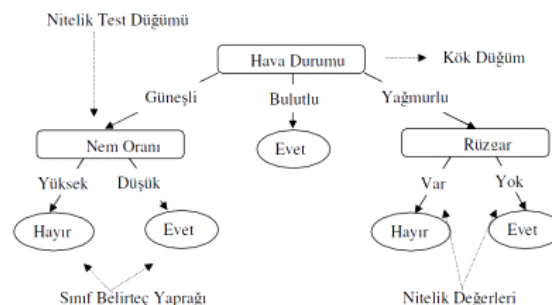

Figure 2.2. A sample of decision tree.

The decision tree is shaped by the questions and their answers. As a result, some rules emerge according to the answers. Once the variable, which is the source of the question, is determined, this variable creates the root node of the tree. The test to be applied is determined by the root node. At the end of the test, the tree is divided into branches and the separation process follow the test. Each of the branches on the are candidates for classification process. If there is a classification at the end of a branch, a leaf emerges at the end of the branch. The leaf is the one of the desired groups in the data. If there is no classification process at the end of the branch, there emerges a decision node on this branch. The decision tree aims to reach the leaf by the shortest way starting from the root node through sequencing nodes.

Each feature is used as a test in order to decide on the classification of the training data. After the best feature is chosen, it is used on the root node for the test. The number of branches changes according to the value of the feature. Which feature is going to be chosen on each node is the main selection of the decision tree. The measure of the feature is determined by a value called information gain which is also defined as entropy.

Entropy: Measuring the disorder in a system or events is called entropy. Entropy is related to the information and when uncertainty and disorder rise, more information is needed to define the data better. The value of the entropy changes between 0 and 1, and the value near 1 means more uncertainty. Therefore, it is necessary to lower the entropy value to 0 in decision trees. When D represents the distribution of probability P (p1,p2,….pn), the entropy equation is as follows:

P_i is the probability of i class in D dataset which is calculated by dividing the sample size of

$$E(D) = -\sum_{k=1}^{m} p_i \ log_2(p_i)$$

the class i by the sample size of the whole data.

If the D dataset would be divided into n subclass in the X variable, the information gain is calculated by the following equation:

$$(D,X) = E(D) - \sum_{k=1}^{n} p(D_i) \ E(D_i)$$

As it is seen in the equation, E(D) represents the entropy before the dataset is divided; i represents the entropy of the subdivision after it is divided $E(D_i)$; $p(D_i)$ is the probability of the i subdivision after it is divided.

Pruning: overfitting may occur when creating a model on the decision tree. While the model becomes successful for the sample data, it can make mistakes with the new data. It occurs when there is too much information to be classified or noisy data in the dataset. Pruning is the process of cutting the branches which are formed by the noisy data and which leads to mistakes. The pruning process has two types: pre-pruning and post-pruning. Generally, post-pruning is preferred. In this process, determined branches are cut or two different branches are combined and cut after the whole tree has been created till the leaves by using the whole data. At the end of the pruning process the tree gets smaller with less error margins (Haciefendioğlu, 2012).

Widely used various decision tree methods are given in the following table:

Table 2.2. Some decision making algorithms (Emel ve Taşkın, 2005).

DECISION TREE ALGORITHM	FEATURES
C&RT	There are two dividing process based on Gini. In each nood, which are not the final or end, there are two branches. Prunning process is based on the complexity of the tree. It is in the form of supporting the classification and regression. It works with the continuous goal variables. It needs the data to be prepared.
C 4.5 and C5.0 (The updated versions of ID3 Decision Tree Algorithms)	The tree is formed by the multiple branches emerged from each node. The number of the branches is the same as the number of categories of the predictor. It combines more than one decision tree in one classifier. It uses the information gain for the separation. Prunnig process is based on the error margin in each leaf.
CHAID (Chi-squared Automatic Interaction Detector)	It performs the separation by chi-quare tests. The number of the branches changes between 2 and the number of the categories that the predictor has.
SLIQ (Supervised Learning in Quest)	It is a fast scalable classifier. It has a fast pruning algorithm.
SPRINT (Scalable Parallelizable Induction of Decision Trees)	It is ideal for big data sets. The separation process is based on the value of only one feature. It functions on the whole memory limits by using the feature list data structure.

*2.*4.3. Support Vector Machines

Support vector machines (SVM) are one of the supervised classification techniques which were founded by Cortes and Rapnik in 1995. SVM is a kind of machine algorithm which makes predictions and generalizations on the new data by learning on the data sets whose distribution is unclear. The main principle of SVM is based on finding the hyperplane which separates the data of two classes the most appropriately. Support vector machines are divided into two categories based on the classification that the data set is separated linearly and not linearly (Güneren, 2015).

Linearly separable case: With SVM it is aimed to separate the samples of two classes which are generally shown with the labels (-1, +1) with two different most appropriate hyperplane by the help of decision function generated at the end of the training data. This process is reached by finding the hyperplane which makes the length between the nearest spots to the SVM maximum. The hyperplane, which makes the border maximum, optimum hyperplane and the spots limiting the border are called support vectors.
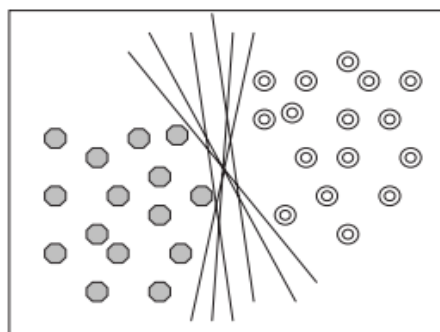

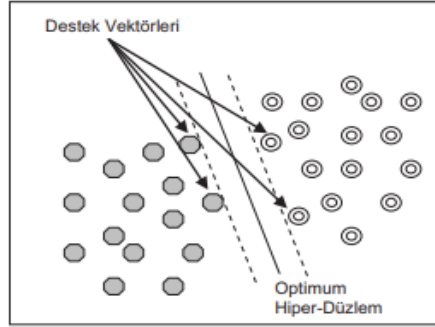*Figure 2.3. Hyperplanes for problem with two class.*

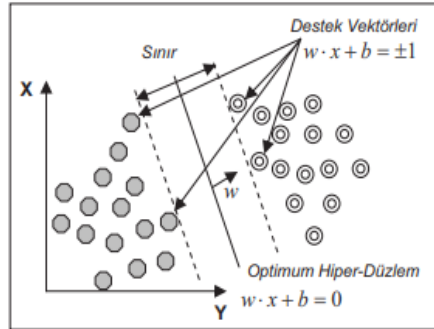*Figure 2.4. Optimum hyperplane and support vectors*

Figure 2.5. Finding the hyperplane for linearly separable data

The decision function for the linearly separable problems can be written like this:

$$f(x) = sign(\sum_{i=1}^{k} \lambda_i \, y_i \, (x \, . \, x_i) + b)$$

Linearly inseparable case: In some cases, it can be impossible to separate the data linearly. In cases like this, the solution is to define a positive artificial variable (ξ_i). With a regulation parameter shown as C, after making the border maximized, the balance between minimizing the classification errors is provided. The optimization problem for the linearly inseparable data using (ξ_i) and C is;

$$min\left[\frac{\|w\|^2}{2} + C \cdot \sum_{i=1}^{r} \xi_i \right]$$

And the limitations are like this:
$y_i (w \, . \, \phi (x_i) + b) -1 \geq 1-\xi_i$
$\xi_i \geq 0$ ve i=1,…,N
In order to solve the optimization problem, the linearly inseparable data is displayed in a high dimensional space. This space is called feature space. By this way, the hyperplanes can be determined in order to separate the data linearly. SVM can be separated highly linearly by the help of kernel functions. The decision function for the linearly inseparable data is written by using the Kernel function (K(x_i, x_j)= ϕ(x). ϕ (x_j)) like this:

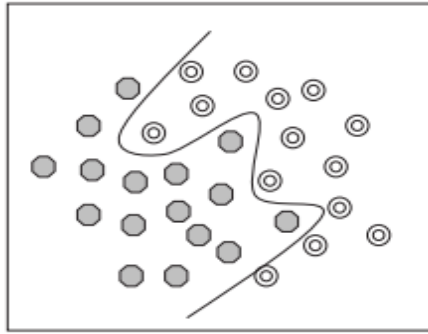$$f(x) = sign(\sum_{i} \alpha_i y_i \phi(x) . \phi(x_i) + b)$$

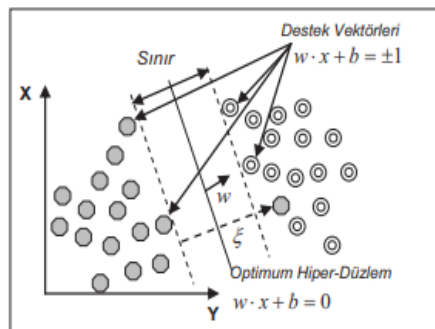*Figure 2.6. Linearly inseparable data set*

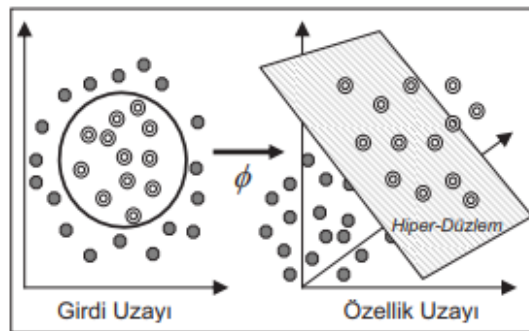*Figure 2.7. Finding the hyperplane for the linearly inseparable data set*

Figure 2.8. Transforming the data into a higher dimension by using Kernel function (Kavzoğlu ve Çölkesen, 2010).

2.4.4. Naive Bayes

Naïve Bayes classification is a kind of classification which is used to label the data by using statistical methods. It is preferred in classification problems as it is easy to apply. In general, in Bayes classification, it is aimed to calculate the probability values of the effects of each criterion to the result. The Naive Bayes calculates the conditional probability of the class to which the data belongs in order to estimate the probability of the class in which the data belongs. To perform those operations, Bayes theorem is used. Bayes theorem is this:

P(A/B) = (P(B/A) * P(A)) / P(B)

In the theorem;

P(A): The independent probability of event A,

P(B): The independent probability of event B,

P(B|A): the probability of event B when event A occurs,

P(A|B): the probability of event A when event B occurs,

The class of the new incoming data can be estimated here by making P (A | B) maximum (Çalış, Gazdağı ve Yıldız, 2013).

Bayes Classification: Here C represents a class and x=x1,x2,x3,….xm are the values of the observed features. The probability of predicting the class according to Bayes theorem x test data is calculated as:

P (C = c_j |X=x) = $\frac{p(C = cj)p(X = x|C = cj)}{p(X = x)}$

In the example P (X = x) is ignored in cases where the expression does not change between classes. The equation is now like this;

p (C = c_j |X = x) = p(C = c_j) p(X = x|C = c_j)

(C = c_j) ve p = (X = x | C = c_j)

is predicted from the learning data.

x_1, x_2, $x_{3,...}$, x_m features are conditionally independent of each other. Therefore, the final equation is like this (Sağbaş. ve Ballı, 2016).

$$p (C = cj |X = x) = p(C = cj)\prod_{i=1}^{m} p(X_i = x_i|C = c_j)$$

2.4.5. Logistic Regression

Logistic regression is a kind of classification method which models the relationship among more than one independent variable and dependent variable. It is an advanced regression method which has gained popularity in social sciences today; however, it was used more in medical sciences in the past.

Logistic regression is a technique that is used as an alternative method to the EKK because the EKK is insufficient in a multivariate model in which dependent and independent variables are discriminated. In the logistic regression analysis, the probability of a dependent variable which has two final values. In addition, the variables in the model are continuous. Because of its this feature, it is frequently used to classify the observations into the classes. The logistic

$\frac{1}{1+e^{-z}}$

regression model is as follows:

$$L=\ln\left[\frac{P_i}{1-P_i}\right] = Z_i = b_0 + b_1X_i + e_i$$

P_i, shows the probability and 1- P_i, shows the improbability, it is calculated as follows:

In the equation, the Z is written like this: Z = $\beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 +… + \beta_nX_n$.

Regression coefficients are shown by β. P values can be reached by taking antilog of Z value. Logistic regression has some differences with other regression methods because of the assumptions. Those differences provide some conveniences too. These conveniences are:

- In regression analysis, independent variables should be continuous and they must have multiple normal distributions; however, these conditions are not required in the logistic regression method.
- Logistic regression analysis assumes that there are no multiple link problems among independent variables.
- The equality condition of the variance-covariance matrices is not required in the logistic regression analysis.

In logistic regression analysis, after the predictions of the coefficients in the model are made, the reliability of the model must be tested. For determining the fitness of the model, Chi-Square test is applied and log similarity function is used in the test. In this method, all logit coefficients outside the constant term are tested to be equal to zero or not. The transformed form of the L statistic, -2LogL, is used in testing the absence and alternative hypotheses. After testing the significance of the model, the significance of the variables in the model must be tested. The results are evaluated after the Wald and Score tests are performed. Then, goodness

of fit model, which is the process of investigating the effect of describing the response variable, is carried out. Finally, after the calculation of the Zi values and the classification of the units, the success rate of classifying the Pi values by calculating the antilog of Zi is obtained (Ege, ve Bayrakdaroğlu, 2009).

2.4.6. K-NN

The k-nearest neighbours algorithm developed by Fix and Hodges in 1951 is based on the logic that the variables which are closest to each other belong to the same class. The main purpose is to classify the new incoming data in accordance with the previously categorized data. Data whose class is not known is called a 'test sample' and previously classified data is called 'learning samples'. In the K-NN algorithm, the distance from the test sample to the learning samples is calculated and then the closest k learning instances are selected. The majority of the selected k samples are used to determine their class; it is also decided that the test sample belongs to that class (Özkan, 2013).

The distance between the data is given by the following equation:

$$d_{(i,j)} = \sqrt{\sum_{k=1}^{p} (X_{ik} - X_{jk})^2}$$

With the new incoming data, the K value is checked first; so, K value must be selected as an odd number in order to avoid equality. In calculations of distance, the methods such as Cosinus, Euclidean and Manhattan distances are performed (Kılınç, Borandağ, Yücalar, Tunalı, Şimşek ve Özçift , 2016).

In cases where there is a lot of learning data in the K-NN classification, the success rate is also increasing. In addition, very effective results are obtained in noisy data. In addition to these successes, however, there are also disadvantages. For example; it is not precisely known which distance measure is used when calculating the distance, and it takes too much time to calculate the measurement of the test sample's distance to the learning samples (Özkan, 2013).

2.5. Machine Learning Application Areas

The previous section includes the theoretical background of the machine learning algorithms. In this section, information about the areas and studies in which the machine learning are used nowadays will be given. Today, the use of machine learning has increased considerably. Although it is though that it can only be done in large studies, many people face machine learning in their daily life. These studies and applications are as follows:

Education: One of the most important application fields is education in which there have been some studies in order to identify and increase success recently. Despite the projects made in the field of education in recent years, the desired success has not been achieved. There are a lot of factors that influence this failure. However, it has not been determined which factor has more influence on this failure. In this context, by a questionnaire applied to secondary school students, the successes of the students in the lessons were predicted by machine learning models, which resulted with success (Gök, 2017).

Similarly, there are some studies in order to determine the proficiencies of students in higher education. In 2007, a study was carried out at Pamukkale University, where the students identified as risky students according to the failure in mathematics course. In the study, it was found out that the scores of 434 students' university entrance exam; mathematics, sciences, Turkish tests and high school graduation scores played a major role in predicting the success in mathematics. In the study, 289 students' data were used for training and 145 students' data

were used for testing. As a result, 86 percent of the students who passed the mathematics course were correctly estimated (Güner ve Çomak, 2011).

Other areas of application for machine learning which have become quite functional in the field of education are:

Image processing: In this method, it is aimed to process and improve recorded images. Some application areas where the image processor is used are as follows:

- Security systems
- Face detection
- Medicine (to diagnose diseased tissues and organs)
- Military (to process underwater and satellite images)
- Motion detection
- Object detection

Computational biology:

- DNA sequencing
- Finding a tumor
- Drug discovery

Natural language processing: It is aimed to investigate and analyse the structures of natural languages. It is possible to perform many applications with natural language processing:

- Automatic translation of written texts
- Question-answer machines
- Automatic summarization of text
- Understanding speech and command

Automotive, aviation and production:

- Detecting malfunctions before they occur
- Producing autonomous vehicles

Retail:

- Customized shelf analysis for persons
- Recommendation engines
- Material and stock estimates
- Purchasing - demand trends

Finance:

- Credit controls and risk assessments
- Algorithmic trading

Agriculture:

- Predicting yields or deficiencies by analysing satellite images

Human Resources:

- Selecting the most successful candidate among a lot of applicants.

Energy:

- Calculating the heating and cooling loads for building designs
- Power usage analysis
- Smart network managements

Meteorology:

- Weather forecast via sensors

Health:

- Providing warning and diagnosis by analysing patient data
- Disease defining
- Health care analysis

Cyber security:

- Detecting the harmful network traffic
- Finding out address fraud

3. CONCLUSION

Along with the developments in the technology in recent years, machines have had a big role in our lives. There are a lot of data gathered in every part of our lives and these data are increasing day by day. Thanks to the machines, these data are used very efficiently. Although these machines are thought to be used only in the fields of engineering and computer science, they are encountered at every part of human life. Firms that have already recognized and invested on this area are using this technology actively today and achieving success. In the future, machines that will be successful in the jobs that cannot be done by human will affect lots of business sectors and people. Some of the known business areas will become extinct and some new business areas will emerge. In such an environment, the power of information technology and machines must be strictly taken into consideration.

Makine Öğrenmesi Yöntemleri ve Uygulamaları Hakkında Bir İnceleme

Özet

Makine öğrenmesi 1950'li yıllarda yapay zekanın alt dalı olarak bulunmuş ve geliştirilmiş bir bilim dalıdır. Makine öğrenmesinin ilk adımları 1950'li yıllarda atılmış olup uzun bir süre gözle görülür çalışmalar yapılmamış ve gelişme gösterememiştir. Ancak 1990'lı yıllarda tekrar gelişme göstererek çalışmalara başlanmış ve günümüze kadar ulaşmıştır. Bundan sonraki zamanlarda daha da gelişecek bir bilim dalı olacaktır. Bunun nedeni de hızla artan veri miktarının (büyük veri – big data) analizinin ve işlenmesinin insan eliyle yapılamayacak olmasından kaynaklanmaktadır. Makine öğrenmesi, artmakta olan bu veriler sayesinde geçmişteki verilerden yeni veriler için en uygun modeli bulma prensibine dayanmaktadır. Bu yüzden gün geçtikçe makine öğrenmesi çalışmaları da artan veriyle doğru orantılı olarak gelişerek devam edecektir. Bu çalışmada da makine öğrenmesinin tarihçesi, makine öğrenmesinde kullanılan yöntemler, uygulama alanları ve yapılan çalışmalar hakkında bilgiler verilmiştir. Bu çalışmanın amacı günümüzde daha da popüler bir hale gelen makine öğrenmesi konusunun ve uygulamalarının araştırmacılara aktarılmasını sağlamaktır.

Anahtar Kelimeler: Makine öğrenmesi, Makine öğrenmesi algoritmaları, Yapay zeka, Büyük veri

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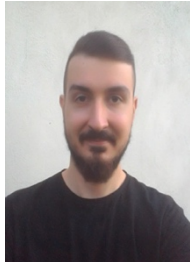
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Book Review: Media Rich Instruction-Connecting Curriculum to All Learners

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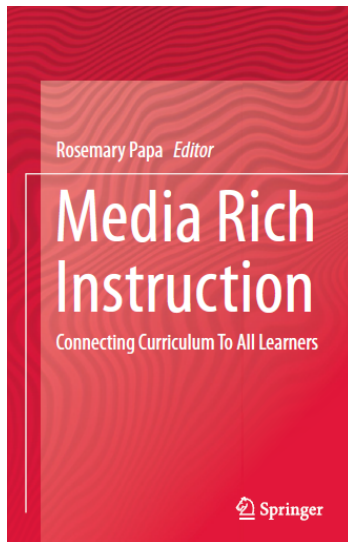| Article Info	Abstract
	Media Rich Instruction- Connecting Curriculum to All Learners is edited by Rosemary Papa. The book was published by Springer in 2015. The book is 311 pages. The ISBNs of the book are as following: ISBN 978-3-319-00151-7 and ISBN 978-3-319-00152-4 (eBook). DOI number of the book is: 10.1007/978-3-319-00152-4.

1. INTRODUCTION

Media Rich Instruction- Connecting Curriculum to All Learners is edited by Rosemary Papa. The book was published by Springer in 2015. The book is 311 pages. The ISBNs of the book are as following: ISBN 978-3-319-00151-7 and ISBN 978-3-319-00152-4 (eBook). DOI number of the book is: 10.1007/978-3-319-00152-4.

Media Rich Instruction examines comprehensive knowledge-learning practices, focusing on different learners and different learning strategies within the context of e-learning. The book, as a remarkable source, highlights the theory of current learning strategies and applications by indicating the recent advances such as personal learning environments, gamification, and the Massive Open Online Courses. Within the scope of collaborative and transformative learning, each chapter depicts different topics that are considered on a preferential basis namely online learning experiences, language and literacy, education technology used in Mathematics, Science, Arts and Social studies, teaching and learning through experiment, practice and most basically technology.

Media Rich Instruction is providing concrete teaching samples that rank teaching strategy and content first. In this connection, this edited book particularly underlines the specific learning/teaching strategies based upon multimedia tools used in educational processes.

The book consists of three main parts that probes up-to-date concerns of e-learning with a broad perspective. First part entitled "21st Century Learning Environments for the Learner" offers four chapters. Part I addresses the changing teaching and e-Learning theories. Part II entitled "Curriculum for e-Learners" and composed of seven chapters. The part lays emphasis on various discipline fields such as reading, writing, language and literacy, mathematics, science, art, social studies, and the new assessments technology requires. Part III entitled "Dynamic e-Instructional Strategies" embodies seven chapters that generally emphasizes

media rich learner characteristics. Overall, there are eighteen chapters that questions three primary questions given below:

1. How are learning theories changing for the learner due to the increasing use of media technology tools?
2. How are curriculum instructional strategies changing due to media/software digital delivery platforms for the learner?
3. What impacts does the changing landscape for the learner have on the delivery strategies?

2. REVIEW of the BOOK

There are eighteen chapters in total. Part I offers four chapters with the given topics addressed by the authors below:

Part I: 21st Century Learning Environments for the Learner

Chapter 1: "Transitions in Teaching and eLearning" authored by the Editor Rosemary Papa guides readers to a discussion of how learning theories and teaching practices, socially constructed learning environments and new learning designs change within the scope of e-learning processes. The author depicts learning theories in detail and how social learning arrangements involve peers and teachers with a focal point on emotion and cognition, the twenty-first century context of learning theories, situated cognition theory, disruptive learning design, game play, mobile apps, B.Y.O.T. (bring your own technology), MOOCs: adapt, adopt, and scale, flipped classrooms, software creation and data mining, educational media and textbooks of the twenty-first century, participative learning and privacy.

Chapter 2: "Motivation to Learn and Achievement" authored by Gypsy Denzine and Ric Brown observes how achievement motivation affect students during the learning journey. The authors guide the readers on the pathways of enhancing student engagement and motivation to learn within the frame of self-regulated learning. With this purpose in mind, the topics related to overview of motivation and achievement motivation, self-regulated learning, locus of control and self-efficacy, student engagement and motivation to learn, task value, beliefs about intelligence and goal orientation theory are all covered in this part.

Chapter 3: "Personal Learning Environments and Self- Regulated Learning" authored by Chih-Hsiung Tu, Cherng-Jyh Yen, and Laura E. Sujo-Montes illustrates the definition of Personal Learning Environment (PLE) and how does it relate to self-regulated learning. In the chapter, the authors display some of the Web 2.0 tools integrated with the concept of PLE that could be used different types of learning (e.g., formal, informal, personal, or lifelong learning). The authors describe learning as a personal, constructive, ubiquitous, collaborative, and connective experience by discussing the concept in different parts namely Personal Learning Environments, self-regulated learning, PLE and self-regulated learning, PLE guidelines, to select personal portal tools, to organize PLE, to share and collaborate on PLE, to link tools to PLE and lastly assessing PLEs.

Chapter 4: "Building Successful Student Learning Experiences Online" authored by Mary I. Dereshiwsky probes the specific technology skills that students need to have to be successful in an online learning classroom. The chapter basically focuses on the obstacles that students face in an online course and offers strategies to cope up with them by mentioning the above

mentioned issues on separated parts namely readiness for online learning, technology issues, communication, study skills and critical thinking.

The following section, Part II, sheds light on specific discipline curriculum and offers seven chapters:

Part II: Curriculum for e-Learners

Chapter 5: "Language and Literacy" authored by Pamela Powell and Jennifer Prior addresses how language development in children can be encouraged and supported. The oral language development tied to overall literacy development is also examined thoroughly. The authors' ideas are enlarged upon different sections namely from infancy through third grade: phases in children's development of reading and writing, professional standards, strategies, tools, productivity and creativity tools, communication and collaboration tools and other tools.

Chapter 6: "Reading and Writing" authored by Michael R. Sampson mainly focuses on the relationship between reading and writing and how the technology has changed the way authors write. The author also describes the transformation of text writing and how writing is being changed from paper to digital formats. Therefore, different titles like language, reading, and writing: the beginnings, the writing process: developing student authors, technology and the writing process, e-books and reading comprehension, professional standards: international reading association, new literacies strategies: vignettes are covered to this end.

Chapter 7: "Points of Intersection: Mathematics Teaching and Learning with and Through Education Technology" authored by Vicki Ross, Jennifer Prior, and Shannon Guerrero divulges
the importance of mathematical practices and the integration of mathematics education and technology. Questions related to the mentioned concerns are pondered in different sections namely What Are the Mathematical Practices?, Why Are the mathematical practices important
in mathematics education?, why bring a focus on the mathematical practices when considering integrating mathematics education and technology? and how can the mathematical practices be integrated with technology?.

Chapter 8: "Science: Learning Through Experimentation and Practice" authored by Shadow Armfield and Cynthia A. Conn introduces the core issues and standards align with the technology integration into science, language and mathematics education. In the chapter, the National Educational Technology Standards for Students (NETS*S), the Next Generation Science Standards (NGSS) and the Common Core issues in relation with technologically supported strategies within K-12 spectrum are elaborated under the main headings such as technologies: how much is this going to cost me?, standards and the language of science, NETS*S, standard 1: creativity and innovation, NETS*S, standard 2: communication and collaboration, NETS*S, standard 3: research and information fluency, NETS*S, standard 4: critical thinking, problem solving, and decision making, NETS*S, standard 5: digital citizenship, NETS*S, standard 6: technology operations and concepts and classroom.

Chapter 9: "Creative Connections: Technology and the Arts" authored by Jennifer Prior and Pamela Powell ponders "the Arts" and its integration with technology and the Common Core State Standards. The different kinds of software and digital tools used to foster student creativity is also highlighted by the authors. The above mentioned concerns are all taken into

consideration under the parts such as the arts and the common core state standards, the arts and technology, the arts for art's sake, creativity tools: visual art, creativity tools: music, creativity tools: dance and drama, productivity tools: art.

Chapter 10: "Social Studies Teaching for Learners Who Engage" authored by Barbara Torre Veltri elaborates the teacher roles for educating children for their roles as citizens in a global Community. In other words, the author draws a pathway for teachers to let students engage in more integrated theories with national standards, content-rich activity modules, and developmentally appropriate classroom strategies. All the covered issues are discussed under the parts namely teaching social studies: challenges and opportunities, applications for practice, social studies integration and four theories applicable to elementary social studies.

Chapter 11: "Comprehensive Assessment Planning: Developing and Managing Multiple Types of Assessments" authored by Cynthia A. Conn embraces the InTASC Model Core Teaching Standards in relation with assessment practices. The benefits of comprehensive assessment and technology-based assessment tools and cost-effective computing devices and applications are reviewed in the following sections namely getting started: assessment planning, developing assessments and lastly commitment to assessment and continuous improvement.

The last section, Part III, underlines e-instructional strategies and offers seven chapters:

Part III "Dynamic e-Instructional Strategies"

Chapter 12: "Online Collaboration and Social Networking" authored by Shadow Armfield, Dawn M. Armfi eld, and J. Michael Blocher looks into the online applications to create a collaborative learning environment. The hardships of implementation of such a learning system into a learning environment is discussed with numerous examples such as collaborative tools, social media, course management systems (CMS), and collaborative development environments under the parts namely theoretical constructs of collaborative learning, online collaborative environments and tools.

Chapter 13: "Gamification for Learning" authored by Chih-Hsiung Tu, Laura E. Sujo-Montes, and Cherng- Jyh Yen provides an insight on gamification and how it supports learning and education. The authors also pay attention to game dynamics and game personalities in order to create a framework that promotes desired learning behaviours. The chapter proposes a model for constructing gamification to design more effective instruction for educators. the parts covered within this chapter are gamification, game theories, gaming personality and a model for constructing gamification.

Chapter 14: "Gaming" authored by J. Michael Blocher starts the discussion by asking what is "gaming?" and who are the "gamers?". In the chapter, the author is concerned about the impact of the gaming culture on learners. The probability of gaming and curriculum integration is also disputed in this chapter under the sections namely gaming elements, types of games and impact of gaming on learning.

Chapter 15: "Collaborative Learning" authored by Laura E. Sujo-Montes, Shadow Armfield, Cherng-Jyh Yen, and Chih-Hsiung Tu mainly explores the form of collaborative learning known as problem-based learning (PBL) and how PBL can help achieve twenty-first century learning standards. The parts discussed in this chapter are design, implementation, and

assessment of a pbl activity, using metacognition: what do we already know?, debriefing of the problem and assessment in pbl activities, pbl.

Chapter 16: "Google Sites and Oral History Projects: Connecting School to Community" authored by Christine K. Lemley and John Martin particularly focuses on three main parts that are Design, Delivery and Assessment. In all parts, high school–university partnership that uses new media technologies are examined broadly to foster student engagement under the sections entitled design: research participants, delivery: community oral history project in action, assessment: collaboration at multiple levels, addressing national educational technology standards.

Chapter 17: "Mobile Learning and Mobile Social Interaction" authored by Chih-Hsiung Tu and Laura E. Sujo-Montes scrutinizes mobile learning environments and questions how these environments differ from other styles of learning. The chapter utilizes the model of mobile social interaction to comprehend effective mobile interaction. mobile learning, interaction and mobile learning, mobile social interaction, a model for mobile social interaction, safety, future research directions are the parts covered here.

Chapter 18: "MOOCs" Massive Open Online Courses, authored by Chih-Hsiung Tu and Laura E. Sujo-Montes peruse how MOOCs impact current education and learning and what are the issues and trends surrounding MOOCs. All MOOC types are elaborated in detail under the paragraphs entitled MOOCs, connectivism as a cMOOC framework, xMOOCs vs. cMOOCs, research in MOOCs, roles of higher education, a model for MOOCs design and development.

3. CONCLUDING THOUGHTS

With the contemporary innovations brought by e-learning, educational technologies have shown great progress. In this regard, *Media Rich Instruction* as a must-see source addresses the existing learning and teaching needs within the context of e-learning theories and practices and, thus, gives concrete examples on educational technologies. In this book, the latest discoveries regarding student cognitive processes and motivation for learning strategies are also mentioned and covered under specific advances such as personal learning environments, gamification, and the Massive Open Online Courses. Each of eighteen chapters has discussed the topics included building successful learning experiences online, language and literacy, reading and writing, Mathematics teaching and learning with and through education technology, learning science through experiment and practice, social studies teaching for learner engagement, the arts and technology and connecting school to community in different aspects. In sum, the book serves as an important reference for those who want to comprehend and foster media rich instructional strategies and practices in relation with collaborative, transformative learning and e-learning.

About the Author (s)

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Nil GÖKSEL currently works as an English language instructor at Anadolu University. She received her MA Degree in Distance Education with "Learner -Instructor Interaction within University-Community Partnerships by Giving Samples from Second Life (SL)" in 2009. To pursue her PhD degree, she then completed a research study entitled "Utilizing the Personal Learning Environment for English as a Foreign Language within the Scope of Open and Distance Learning" in 2018. Her research interests lie broadly in online-immersive learning, new learning technologies, Personal Learning Environments (PLEs), educational social networks, virtual interaction, Augmented Reality, Web 2.0 tools used for foreign language teaching and learning, Artificial Intelligence and Intelligent Personal Assistants (IPAs).

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