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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 Bielefeld Academic Search Engine, DRJI, Eurasion Scientific Journal Index, Google Scholar, i2or, Index Copernicus, J-Gate, ResearchBib, ROAD, Rootindexing.

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From the Editors

Dear JETOL readers,

We proudly introduce the second volume, first issue of JETOL: Journal of Educational Technology and Online Learning in 2019. JETOL is a refereed, open access e-journal that disseminates original research, theory, and best practice on educational technology and online learning.

In 2018, we published three issues. We would like to thank to all authors and reviewers who contributed who contributed by doing so to the field of educational technology and online learning. In our first year, we gained a great momentum and indexed in different databases: Bielefeld Academic Search Engine (BASE), CiteFactor, COSMOS IF, DRJI, Eurasian Scientific Journal Index, Google Scholar, i2or, Index Copernicus, J-Gate, ResearchBib, ROAD, and Rootindexing. We hope that JETOL will continue to be a premier source for those who seek and pursuit knowledge.

In this issue we have five articles. The first article, written by Abdullah SAYKILI, is entitled "Higher Education in The Digital Age: The Impact of Digital Connective Technologies." The second article, written by Şükran AKPINAR and Mehmet Emin KORKUSUZ, is entitled "Influence of Active Learning on Undergraduate Students' Achievements in and Attitudes Towards Simple Electric Circuits in Physics." The third article, written by Murat ATAİZİ, Önder ÖZTÜRK, Muhammed DEMİR, Sümeyye KAYA, Ahmet İŞCAN, Seher İŞKOL, Aslıhan Bağcı, Emine TUTSUN, Muhammet ALPASLAN, and İstek AKSAK KÖMÜR, is entitled "Examining Mooc Videos in Terms of Learning Theories." The fourth article, written by Chen CHEN, is entitled "A Comparative Study of Online Teacher-Involved and Peer Interactive Learning: Chinese EFL Students' Perceptions and Practices." The final article, written by Serkan ÇANKAYA, is entitled "Use of VR Headsets in Education: A Systematic Review Study."

We hope and believe that, as an open access journal, we will move forward and contribute the scientific knowledge dissemination.

Yours respectfully,

Dr. Gürhan Durak

Dr. Aras Bozkurt

Editors in Chief

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HIGHER EDUCATION IN THE DIGITAL AGE: THE IMPACT OF DIGITAL CONNECTIVE TECHNOLOGIES

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Review Article

Abstract

The dominant roles that digital connective technologies have in the 21st century are causing profound changes in all domains of life, which signal that we have reached a new age: the digital age. Education is one of the fundamental domains of life re-engineered to adopt to the changing landscape of what it means to function in this new age. The school paradigm which rests on the conditions and requirements of the industrial age appears to fall short in terms of meeting the needs and demands of the 21st century learner. The emerging digital connective technologies and the educational innovations they triggered such as open educational resources (OER), massive online open courses (MOOCs) and learning analytics are disrupting the learning processes and structures of the industrial age such that it is now an imperative to develop a new educational paradigm. These new innovations enable learners to extend learning outside the boundaries of traditional learning institutions through informal and enriched learning experiences using online communities on new platforms such as social media and other social platforms. The digital innovations aforementioned also free the learners from the shackles of time so that learners can, not only access but also create knowledge through social interaction and collaboration. The age we live in is ripe for unprecedented fundamental changes and opportunities for higher education (HE). Therefore, policymakers involved in education need to re-think the implications of digital connective technologies, the challenges and opportunities they bring to the educational scene while developing value-added policies regarding HE. This paper addresses the learner, instructor, learning environments and the administration dimensions of HE and how the digital connective technologies are impacting on these dimensions in the digital age. The paper also offers, as a conclusion, a road map for HE to better function in this age.

Keywords: Digital technologies, higher education, paradigm shift, digital age, open educational resources (OER), massive online open courses (MOOCs)

1. INTRODUCTION

Digital connective technologies in the 21st century have been deeply impacting all domains of life including the social, economic and the political. Such technologies of the 21st century have triggered dramatic changes in the ways people interact with content, communicate with one another and function in the society as well. Furthermore, the drastic changes are not simply

restricted to increased opportunities for written, audial and video communications through highly interactive media. The opportunity to access and communicate with others located in distinct parts of the same country of residence, or even the whole world in a wider context, and the distinct new ways to interact, share and relate to the information others have shared via new media have even taken part in pressurizing key governmental processes. In addition to increasing ways of communication, these new technologies have caused drastic changes in how people access information. Print books and encyclopedia in the traditional sense are not the sole information holders but information is now distributed across the network of connected digital technologies that allow access anywhere anytime wherever such connections are possible. Yet, the real transformation lies not in the increased and diversified ways of accessing information, rather in the increased opportunities for individuals to contribute to content production and knowledge building. Today, each and every individual has the potential to not only consume, but also produce information. The individual's production and dissemination activities play vital roles both in the academic realm and in the social concerning particularly areas of administrative processes in which the individual wishes to take part. The age we live in shows fundamental differences in how the society functions as a whole in that the world is connected through digital means in an unprecedented scale. Shortly, the tools people utilize – the digital tools – are inciting drastic changes in all domains of life in, what we may call, "the digital age". The complex and chaotic nature of these changes pressurized by the impact of the digital connective technologies are disrupting the very fabric of socio-economic structures of the society, which initiate transformational processes in attempts to better suit to the needs and the requirements of the digital age (Odabaşı, 2006). When all domains of life including the societal and economic structures are experiencing change pressures and striving to conform to the 21st century so as to function better in addressing the needs and requirements, it is only natural to expect such transformational changes in the educational domain so that it better serves the needs and demands of the society in this new age. The higher education institutions (HEIs), which have distinct roles in producing and disseminating knowledge, have been experiencing such change pressures much more strongly (Şahin & Alkan, 2016). Therefore, the global competition for knowledge economy fueled by the dominant roles of the digital connective tools (Rust & Kim, 2012) is forcing the HEIs to evaluate their current structures and take drastic decisions to improve these structures to better suit the needs and requirements of the 21st century (Odabaşı, Fırat, & İzmirli, 2010).

Aşkar (2013) summarizes the digital advancements forcing HEIs to transform and adopt to the 21st century. Among the forces for a reform in HE structures are; knowledge access and dissemination roles shifting away from HE; digital platforms bearing new interaction and affective expression schemes, new ways to express culture, its related artefacts, and values; social media effects; big data and learning analytics; massive online open courses (MOOCs) and open educational resources (OER); educational games and the advancement of digital platforms enabling increased interaction and collaboration between and among instructors and learners. However, it has been highlighted in the literature that the change pressures triggered by the digital connective technologies haven't found ample voice from HEIs and that they are struggling in their efforts to adopt to the digital age (Aşkar, 2013; Lonka, 2015). In addition to the digital innovations and the changes imposed by these innovations, HEIs are facing new

challenges peculiar to the 21st century including the changing and diversified learner profiles, increased learner mobility, lifelong learning and increased market based competition with the new tertiary education providers (Erdem, 2006; Şahin & Alkan, 2016). The administrative and structural changes imposed by the challenges HEIs have to deal with are addressed within three broad categories; 1) changes in delivery of services and finance of these services, 2) changes in administrative processes, 3) changes in the learning and teaching paradigm (Odabaşı, Fırat, & İzmirli, 2010). Erdem (2006), on the other hand, underscores the changes in responsibilities of the three distinct structures of the society; government, society and universities. Erdem (2006) posits that the dynamic relationships between HEIs and the state have been experiencing changes due to the advancements in the 21st century concerning increased accountability requirements placed on HEIs, the impact of digital technologies on delivery of educational services and realization of research practices, internationalization of HE and increased global competition. Yet, another challenge the HEIs are facing today is that they are seen as highly complex businesses as resources for knowledge society and knowledge economy, which impact deeply on internal processes and external relations that universities have with the non-academic community.

Digital tools are offered as solutions to the aforementioned structural and administrative challenges that HEIs face today. Regarded as affordances brought about by the digital connective technologies in the 21st century, the distance learning tools, sophisticated learning management systems (Glenn, 2008), online social networking tools, virtual and augmented reality (Şendağ & Gedik, 2015), OER and MOOCs are seen as innovations that contribute to enabling equal educational opportunities for all, accessing quality educational content, and supporting lifelong learning (Karip, 2013). On the other hand, the very same innovations offered as solutions potentially prove to be further challenges. The fundamental reasons for these innovations to act as further potential challenges are lack of proper policy and planning, insufficient resources allocation, shortage of qualified staff for instructional design and technical support, rapid and constant update requirements (Glenn, 2008). HEIs also act reluctant in their consideration for the integration of these innovations owing to the concerns such as causing distractions, plagiarism and cheating. For these reasons, while investigating how the digital innovations can effectively provide solutions to the challenges HEIs face in the 21st century, it is of paramount importance to examine the potential challenges and the ways to deal with these challenges they might imply for the educational landscape.

As previously stated, the HEIs are experiences multiple change pressures regarding structural and administrative processes due to digitalization and digital innovations as a result. Glenn (2008) highlights that more and more individuals demand access to HE in line with the developments in digital technologies and these technologies present a potential to address the needs and requirements of the diversified learner profiles. However, the considerably wide gap between what these technologies are capable and how HEIs function and operate currently in the 21st century causes discrepancies in terms of benefitting from the full potential of the digital technologies (Collins & Halverson, 2009). Therefore, HEIs need to redesign their structures and operations keeping the potentials alongside the challenges brought about by the digital connective technologies (Glenn, 2008). HEIs need to reconsider their mission and visions to

align with the developments in digital technologies and the pedagogical and structural implications of these technologies for the educational space (Şendağ & Gedik, 2015). In the 21st century, the HEIs need to improve on their research and development capabilities, competitiveness, and interoperability between distinct disciplines, innovation and problem solving capacities. They are also required to transform into institutions which can adopt to the digital age, have innovative and scientific productivity with a global vision. While doing all these, HEIs need to integrate with the society operating with a sense of entrepreneurship when managing their human and non-human resources (Şahin & Alkan, 2016). The age we live in is ripe for unprecedented fundamental changes and opportunities. Therefore, policymakers involved in education need to re-think the implications of digital connective technologies, the challenges and opportunities they bring to the educational scene while developing value-added policies regarding HE. This paper addresses the learner, instructor, learning environments and the administration dimensions of HEIs and how the digital connective technologies are impacting on these dimensions in the digital age. The paper also offers, as a conclusion, a road map for HEIs to better function in this age.

2. THE LEARNER

One of the fundamental elements pressurizing HEIs to change is associated with the learner. Not only is the population of learners increasing, but also the learner profiles are changing and diversifying. More and more individuals prefer to go back schooling after graduation for reasons such as professional and personal development needs since the qualities acquired at school years are not sufficient to tackle the problems faced in professional life in the 21st century. Additionally, technological advancements are deeply transforming the qualifications that the workforce need to develop today and in the future such that it is estimated that around 65% of the primary school children today will work in jobs that do not exist now (Şahin & Alkan, 2016). Therefore, one of the critical questions that HEIs have to deal with is what it means to be an educated individual in the 21st century (Glenn, 2008). In order to better function in society and succeed in professional life in the fast-changing digital age, learners need to develop 21st century skills including learning and innovation skills, information, media and technology skills, and life and career skills (AASL, 2007; P21, 2015; Dede, 2009). Various organizations including The Partnership for 21st Century Learning (P21), American Association of College and Universities (AAC&U), the Organization for Economic Cooperation and Development (OECD), American Association of School Librarians (AASL) have published reports underscoring the 21st century skills. These skills that learners need to develop for citizenship in the digital age are composed of hard skills which imply tool utility skills including digital literacies and soft skills which refer to flexibility, adaptability and information processing (Doyle, 2016). Although there are different descriptions as to what the 21st century skills include, these skills are categorized into three main categories and associated subcategories (Trilling & Fadel, 2009):

1. Learning and Innovation Skills include critical thinking and problem solving, communication and collaboration, creativity and innovation skills;

2. Information, Media and Technology skills include information literacy, media literacy and information and communication literacy;
3. Life and Career Skills include flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership and responsibility skills

Since the main objective of this paper is not to differentiate between various definitions of the 21st century skills, the varying skill sets won't be presented here (for a comparison of 21st skill sets see; Dede, 2009). However, in addition to the three main categories offered by the P21 initiative, AAC&U (2007) has proposed the skill sets that learners at HEIs need to develop. Even though there are fundamental similarities between skills proposed by P21 and AAC&U, the skills by AAC&U are considered more relevant for the purposes of this paper because they are particularly designed for HE. For this reason, The Essential Learning Outcomes framework that includes the 21st century skills proposed by AAC&U is presented below (AAC&U, 2007, p. 3):

1. Knowledge of Human Cultures and the Physical and Natural World through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts,
2. Intellectual and Practical Skills including inquiry and analysis, critical and creative thinking, written and oral communication, quantitative literacy, information literacy, teamwork and problem solving,
3. Personal and Social Responsibility including civic knowledge and engagement—local and global, intercultural knowledge and competence, ethical reasoning and action, foundations and skills for lifelong learning
4. Integrative learning including synthesis and advanced accomplishment across general and specialized studies

The question that arises from these two frameworks is whether HEIs are properly equipped and structured to develop the 21st century skills framed with these two frameworks. HEIs need to reconsider their structures including curriculum, learning environments and evaluation schemes.

In addition to the 21st century skills, the learner profiles are also changing. Learners have already integrated digital tools in most of the things they do (Oblinger, 2008). The tools that learners use so skillfully in their daily lives are already reshaping learning styles and habits (Dede, 2005). Thus, learners begin HEIs with a different mindset than the generation before them (Siemens, 2006). In a study carried out by Xerox in 2002 with 15 year-olds Brown (2002) discovered that learners today are equipped with different skills such as;

a. Multiprocessing which refers to the ability to multitask,
b. Information navigation and screen and image literacy besides text literacy,
c. Constantly discovering new things while browsing digital libraries,
d. Learning in situ

Learners today are surrounded by computers (desktop, laptop and tablet), mobile devices (smart phones) and by the applications installed on them. These technologies and applications are shaping the ways learners think and behave (Glenn, 2008). Learners today are more willing than ever to create online learning communities and take active roles in these communities (Glenn, 2008; Lonka, 2015). For this reason, according to Brown (2002) learning in the digital age is as social as it is cognitive for today's learners. For them, learning is a concrete concept rather than abstract and it is intertwined with discovery and reasoning. The digital platforms are not only places where they access information and social resources but also platforms for learning through social construction of knowledge. Within this regard, these learners are both consumers and producers of information (Dziuban, 2006). However, concerns in some aspects are raised as well. For example, experts are concerned that learners are not aware of the ethical and legal consequences of their online actions and discourses (Barkley, 2013). Furthermore, Lonka (2015) concludes that the students who are the most easily distracted and bored are the ones that are the most competent digital tool users. Additionally, according to Lonka, the fact that learners can skillfully use the digital tools and environments may not necessarily translate well into their ability to utilize them for educational purposes. The critical question here is whether these students do not possess the skills to utilize the digital tools and platforms for educational purposes or whether they are not simply provided with opportunities to learn using these tools in their educational processes. What is for certain according to some educators is that traditional teaching methods fail to attract learners today (Şahin & Alkan, 2016).

Another change in the learner profile in HE in the digital age is increased learner diversification. Today more and more individuals opt to pursue an additional degree at university or go back schooling through certificates, graduate degrees or online course due to professional requirements because the skills they acquired previously is simply not enough to carry out the tasks at work. Moreover, increased learner mobility enables various individuals from different ethnic and cultural backgrounds to get together in educational environments (Vardar, 2013). All these new dynamics indicate that learners with different demographics such as age, experience, culture and ethnics, learning styles and paces bring their distinct characteristics into the learning environment, which poses new learning potentials and challenges for the learning environment.

In conclusion, HEIs are experiencing serious challenges in terms of learners in the digital age. The skills and knowledge students need to acquire at the university are changing and evolving into the so-called 21st century skills. Also, the digital tools and platforms are reshaping how learners today think and behave and they begin the HEIs with skill sets different than those of the previous generations. Yet another challenge faced is the changing learner profiles due to increased learner mobility and learners returning HE. With their current structures and functions HEIs is struggling to meet the needs and demands of today's learner profiles. HEIs are advised to develop policies and practices in line with the developments in the digital connective technologies that support learner capabilities in the digital age focusing on the 21st century skills considering the diverse learner profiles.

3. THE INSTRUCTOR

The advancements in digital connective technologies in the 21st century trigger another change pressure in the roles and responsibilities of the instructors at the HE. Additionally, instructors also are required to be equipped with new sets of skills and qualifications in the digital age (Odabaşı, Fırat, & İzmirli, 2010). The role of the instructor in the educational landscape is changing. The past decades when the instructor was the sole information and knowledge provider is making way for an age in which information and knowledge is distributed across digital networks accessible anytime and anywhere wherever connections are possible. This means learners now have the opportunity to access information and knowledge not only at schools from the instructors or at libraries from printed books, but also from digital repositories, web sites, social media and online learning communities and networks. In short, learners in the digital age have access to a wide range of online resources and various knowledge experts through online social connections. However, the role of the instructor at the current HE structures is that of information provider (Collins & Halverson, 2009). What all this implicates is that not only does the resources for information and knowledge but also the content is varied. The learners are exposed to information that is sometimes at odds with that presented by the instructor. Therefore, the information provided by the instructor is constantly questioned and the information providing role is not sufficient in the digital age. For these reasons, the role of the instructors needs to be re-structured from the information providing 'sage on the stage' to the 'guide on the side'. The instructor's role needs to be that of learning designer, context and resources provider and a facilitator for the development of high order skills (King, 1993). While carrying out the new roles assigned, the instructor is required to make use of the innovations peculiar to the digital age such as social media, open educational resources, massive online open courses, sophisticated learning management systems, big data, learning analytics and adaptive learning (Lonka, 2015). Therefore, one of the fundamental roles of the instructor is that of a learning engineer who designs effective and engaging learning environments which address the skills and characteristics of the 21st century learner through the use of digital innovations (Karlı, 2013). However, this role is not that of a technician who writes codes and solves technical problems rather an intellectual who provides learners with individualized learning contexts and quality assurance and evaluations (Prensky, 2008). To be able to effectively fulfill this role, the instructor needs to develop new sets of skills in the digital age.
The American Association of Colleges of Teacher Education (AACTE) and P21 published a joint report on the skills that an instructor should develop in the 21st century (AACTE & P21, 2010, pp. 11-12) including;

- Successfully aligning technologies with content and pedagogy and developing the ability to creatively use technologies to meet specific learning needs,
- Aligning instruction with standards, particularly those standards that embody 21st
- century knowledge and skills,
- Balancing direct instruction strategically with project-oriented teaching methods,
- Applying child and adolescent development knowledge to educator preparation and education policy,

- Using a range of assessment strategies to evaluate student performance and differentiate instruction (including but not limited to formative, portfolio-based, curriculum-embedded and summative),
- Participating actively in learning communities; tapping the expertise within a school or school district through coaching, mentoring, knowledge-sharing, and team teaching,
- Acting as mentors and peer coaches with fellow educators,
- Using a range of strategies (such as formative assessments) to reach diverse students and to create environments that support differentiated teaching and learning,
- Pursuing continuous learning opportunities and embracing career-long learning as a professional ethic.

In conclusion, the roles and qualifications of the instructor is changing in addition to that of the learners because of the dominant roles of the digital connective technologies in the 21st century. The primary change in the role of the instructor is that from the 'information provider' to that of 'facilitator for learning'. This paradigmatic shift necessitates the instructor to leave his/her high seat and situate himself/herself by the learner's side as well as developing new skills. What HEIs need to do in this context is to take the necessary steps in determining the roles that the instructor need to play and the skills he/she needs to develop and take action in supporting the instructor as he/she puts these new roles into action. Yet, the current structure of the HEIs doesn't support these new roles and skills since research and publications-based evaluation schemes doesn't potentially allow for a transition from 'teaching' to 'facilitating learning'.

4. THE LEARNING ENVIRONMENT

The current emerging understandings on how learning occurs should be addressed before dealing with how the digital innovations are shaping the learning environments and the associated changes observed in the learning environments in the digital age. We are observing a shift from the traditional learning through information acquisition models towards collaborative knowledge construction models of learning in the digital age. In this age, in line with the pedagogical shifts, informal learning plays a vital role in shaping the learning activities of the individual (Lonka, 2015). For this reason, developing collective cultural practices along with both organizational and physical structures to support collaborative knowledge construction gains particular importance for educational institutions (Lonka, 2015). On the other hand, HEIs are currently struggling to provide the required organizational and physical structures for such practices. Colins and Halverson (2009) underscore the mismatch between the pedagogical and technological innovations and the current structures of HEIs. According to them, in order to realize the desired changes in the learning environments the following technology-based reforms should be considered (Colins & Halverson, 2009);

- Transition from standardized learning to individualized learning: each and every individual is expected to learn the same content in the same way and time. However, this practice contradicts the very nature of human learning considering the individual differences. On the other hand, one of the biggest advantages that the current digital

innovations have brought up is individualizations since these innovations enable to determine learning styles, interests and pinpoint the challenges and difficulties each individual is having through learning analytics and big data collected throughout the educational processes. This way, it becomes possible to make informed decisions and apply the necessary changes for custom designed deep learning experiences. In short, making use of the affordances brought about by these technologies allows the design of adaptive learning environments sensitive to individualized learning.

- Transition from standardized evaluation to specialization: standardized learning assessed through standardized evaluation via multiple choice tests implies that learners need to learn the same content. However, this falls short in realizing the 21st century skills. The digital technologies help to identify the learner's tendencies and provide individualized evaluation tools.
- Transition from knowledge-in-the-mind model to knowledge-in-external-resources model: according to the traditional model learning fully means internalizing without referring to external resources. Thus, learner's ability to recall information without referring to books, computers or web pages is assessed. However, in daily and professional life, individuals have to solve problems, access external sources for information and realize certain tasks. Their ability to effectively and efficiently access and utilize the external resources plays vital roles to be able to function effectively in social and professional life in the digital age.
- Transition from content coverage to knowledge discovery model: in the traditional school model the primary objective is to convey all the information that a learner will need after graduation from school. The curriculum has become more and more intense and course books much thicker with the increased knowledge treasures. It has become almost impossible to cover all the information and knowledge that learners will need in the future during their time at school due to exponentially increasing information and knowledge which also keeps updating incessantly. Therefore, learners need to develop skills such as accessing true and up-to-date information and learning how to learn.
- Transition from learning through acquisition to learning by doing: the traditional model of learning requires the learner to acquire concrete information, concepts, procedures, theories and formulas. On the other hand, digital tools help learners to carry out practice-based meaningful tasks. For this reason, these technologies allow for creation of learning environments suitable for learning by doing model.

The pedagogical shifts triggered by the digital innovations mentioned above requires the transition from one dimensional learning spaces (classroom, library, lab) to multidimensional collaborative learning spaces (physical, virtual and online) (Glenn, 2008). For deep and meaningful learning experiences in the digital age the creation of hybrid learning environments composed of socio-digital participation schemes which utilize the affordances of the digital, mobile, virtual, online, social and physical spaces is recommended (Lonka, 2015). Research suggests that learners develop better learning outcomes when they're exposed to hybrid learning environments compared to single learning spaces (Glenn, 2008). It is predicted that we'll see more of hybrid learning environments that are supported with tools that allow online collaboration, software that support individualized adaptive learning, sophisticated learning

management systems with social learning applications, online gaming and simulations and social media applications (Glenn, 2008).

We need to create hybrid learning environments that integrate physical, virtual, online and digital spaces and fully take advantage of the affordances each of these spaces aware of their complimentary features in order to design deep and meaningful learning experiences free of constraints from time and place (Karip, 2013). We also need to develop further understanding as to which platforms are more effective in supporting what kind of learning through what type of content and activities so that we can develop policies and strategies that inform the reforms reflecting the required in structural and organizational changes in HE.

5. THE ADMINISTRATION

The higher education institutions (HEIs), which are located on the top of the education systems, with their roles in producing and disseminating knowledge are involved in directing the social changes brought about by the digital connective technologies and they are influenced by these social changes in return. The roles, responsibilities and functions of the HEIs change depending on the socio-economic conditions of the ages they operate in (Şahin & Alkan, 2016). Today, the HEIs are expected to fulfil several roles including educating qualified individuals for the knowledge age through engaging and effective learning experiences. They are also expected to lead the technological advancements through research and development in collaboration with the society and the industry thereby contributing to the societal and economic development (Şahin & Alkan, 2016).

The digital innovations in the 21st century that impact on the learner, instructor and the learning environment also reshape the administrative functions of the HEIs. For instance, the online social network tools enable to keep constant contact with the graduates possible and thus career development practices are carried further into after graduation. Additionally, student information systems make student affairs tasks easier such as course registrations and scholarships. Digital libraries and learning management systems enable learners to access course resources regardless of time and space. However, while HEIs make use of the digital technologies effectively in terms of logistical support, policies regarding the provision of deep and meaning learning supported via the digital connective technologies are not developed as required. Digital age doesn't only imply the adoption of technological devices for logistical reasons only. Digital age also indicates a mind change for the realization of 21st century skills (Cabellon & Junco, 2015). Lonka (2015) highlights the discrepancies between the administrative functions of the HEIs and digital competencies and informal learning practices of learners today. Therefore, administrators and policy makers involved in the HEIs need to increase their understanding into how learning technologies shape learning in the 21st century and how these technologies impact on the interactions between learners, instructors and learning resources. They are also required to work collaboratively with learning designers and experts to design effective hybrid learning spaces for meaningful and deep learning (Collins & Halverson, 2009). Failure in development of political, administrative and pedagogical support will hinder the realization of the full potential the innovative digital technologies might bring

into the educational space (Schejbal, 2012). For example, the laptops distributed in a high school in the USA were taken back seven years later because they weren't serving learning and they were disrupting learning processes (Hu, 2007). Across the world in Turkey, the tablet computers distributed for the FATIH project were reported not to serve its purpose (Hürriyet, 2015). Yet, it was reported that in Finland the access to digital devices were sufficient but there was a lack of understanding as to how to utilize these tools for academic purposes (Lonka, 2015). These examples from various parts of the world show that without the required administrative, pedagogical and legal policies in place the integration of these innovative technologies into learning spaces might cause damages rather than benefits in terms of supporting meaningful learning. Therefore, when supporting learning through digital connective technologies effective administrative structures and functions need to be developed first (Karip, 2013).

In conclusion, the HEIs need to utilize the digital technologies not only for logistical administrative purposes but also as pedagogical tools for managing learning experiences and for the development of the 21st century skills that learners need to develop to better function in the society. Policy makers and administrators involved in HEIs should take steps in developing ethical, administrative and pedagogical policies and action plans for the integration of digital tools as pedagogical agents in learning spaces. HEIs need to foresee the future, plan ahead to take crucial steps and manage chance while initiating the reforms required of them.

6. CONCLUSION AND SUGGESTIONS

In the 21st century, which is marked by the digital innovations, economic, social, political and societal domains are being reshaped by the digital connective technologies in a scale unprecedented before such that it indicates that a new age has been reached; the digital age. Similar to the impact on the other domains of life digital technologies have been impacting on the educational domain as well (Glenn, 2008). In addition to the access, connection and interaction possibilities afforded by the digital technologies, exponentially increasing information, changing and diversifying learner profiles and new understandings developed as to what it means to learn in the digital age require the HEIs to reconsider their structures and functions which were developed centuries ago. The current advancements in these areas also raise suspicions as to whether the HEIs capabilities to function effectively resting on the paradigms of old. Digital tools and applications are offered as solutions to the challenges faced by the HEIs. Research suggest that hybrid learning environments that integrate the digital, virtual, online and physical environments are more effective in providing deep learning. It is observed in the 21st century that as the skills the learner needs to develop are changing so are the roles and skill sets the instructor need to have. In addition, the variety of the learning environments where learners can construct knowledge is also increasing. However, the HEIs are falling behind in dealing with these changes due to their traditional administrative structures. The dominant roles associated with teaching are distributed in the 21st century through new developments such as distance learning, open educational resources and massive online open courses, learning on the job, social media and informal learning, which point towards the advent of a new HE paradigm (Collins & Halverson, 2009). The cumulative effect of these innovative

approaches in the digital age is the distribution of learning across a variety of locations apart from the classroom exceeding the temporal and physical boundaries of school. Today, learning doesn't cease after graduation rather it extends to an individual's lifetime. Although the HEIs address these developments as positive, the adoption and proper utility of these innovations are hindered due to reasons such as the strict organizational culture, lack of pedagogical frameworks, leadership and lack of appropriate policies and legal regulations. Moreover, immediate issues related to distraction, cheating, plagiarizing and ethical misconduct are among the reasons for late and improper adoption. The current administrative and functional challenges also pose other hindering factors in the way for realization of value-added benefits (Glenn, 2008). The change pressures mentioned previously have come about impacting one another. Yet, they impact on the learning landscape both individually and collectively. All these innovative technologies and approaches need to be brought together in a strategic manner so that a holistic reform can be realized in the educational systems (Collins & Halverson, 2009). Even though the new paradigm that emerges from the synergy produced by these innovations carries traces from the traditional paradigm, it will also exhibit deep paradigmatic differences. For this transformation to take place systematic, consistent and sustainable policies that overcome the traditional teaching paradigm and support the learning paradigm (Barr & Tagg, 1995) in every dimensions of HE needs to be developed.

Dijital Çağda Yükseköğretim: Bağlantıcı Dijital Teknolojilerin Etkisi

Özet

Bağlantıcı dijital teknolojiler 21. yüzyılda yaşamın tüm alanlarında derin etkilere neden olmaktadır. Bu durum yaşadığımız çağın ötesinde bir çağa - dijital çağa – eriştiğimizin bir göstergesidir. Bu yeni çağda bireylerin toplum içinde etkin bir şekilde rol alabilmeleri için yeniden tasarlanması gereken alanlardan biri de eğitimdir. Sanayi çağının şartları ve gereklilikleri üzerine kurulu okul paradigması 21. yüzyılda öğrenenlerin ihtiyaç ve isteklerini karşılamada eksik kalmaktadır. Günümüzde ortaya çıkan bağlantıcı dijital teknolojiler ve bu teknolojilerin tetiklediği açık eğitim kaynakları (open educational resources), kitlesel açık çevrimiçi dersler (massive online open courses) ve öğrenme analitikleri gibi yenilikçi eğitim uygulamaları sanayi devriminden kalma öğrenme süreç ve yapılarını derinden etkilemektedir. Bu nedenle, yeni bir eğitim paradigması geliştirilmesine ihtiyaç duyulmaktadır. Sözü edilen yenilikçi eğitim uygulamaları, yeni çevrimiçi sosyal platformlarda yapılandırılmamış (informal) ve zenginleştirilmiş öğrenme deneyimleri sağlayarak öğrenmenin geleneksel eğitim kurumlarının dışına taşınmasına imkan tanımaktadır. Ayrıca bu yenilikler öğreneni zaman sınırlarından kurtarmakta ve öğrenenler hem bilgiye erşme hem de sosyal etkileşim ve işbirliği yoluyla bilgi inşa etme fırsatı elde etmektedir. İçinde yaşadığımız çağ yükseköğretim açısından köklü değişim sancılarına ve fırsatlara gebedir. Bu nedenle, eğitimle ilgilenen politika üreticiler ve yöneticiler bağlantıcı dijital teknolojilerin eğitim alanı bağlamında sağladığı fırsatları ve sunurları değerlendirerek yükseköğretime dair katma değeri yüksek politikalar ve uygulamalar geliştirmelidir. Bu makalede yükseköğretime ilişkin öğrenen, öğreten, öğrenme ortamları ve yönetim boyutlarının bağlantıcı dijital teknolojilerden nasıl etkilendiği ele alınacak ve sonuç olarak bu çağda daha iyi işleyebilmesi açısından yükseköğretim için yol haritası önerilecektir.

Anahtar kelimeler: Dijital teknolojiler, yükseköğretim, paradigma değişimi, dijital çağ, açık eğitim kaynakları (OER), kitlesel açık çevrimiçi dersler (MOOCs)

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INFLUENCE OF ACTIVE LEARNING ON UNDERGRADUATE STUDENTS' ACHIEVEMENTS IN AND ATTITUDES TOWARDS SIMPLE ELECTRIC CIRCUITS IN PHYSICS

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Abstract

This study examined the influence of active learning method on students' achievements in and attitudes towards simple electric circuits within the scope of the course of physics. The active learning method allows students to structure the information themselves by doing and experiencing. The study was carried out with 28 students from the department of Computer Education and Instructional Technologies of a state university in a period of five weeks including the process of data collection within the scope of the physics lesson unit of Simple Electric Circuits. In the application process of nine course hours in three weeks, the lesson unit of Simple Electric Circuits was taught to the students with the help of simulation-like activities that they developed based on their own coding using the programming environment of Scratch to solve the given problems. In the study, as the data collection tool, the "Attitude Scale for the Lesson Unit of Simple Electric Circuits" developed by Erdal TAŞLIDERE and Ali ERYILMAZ, the Simple Electric Circuits Achievement Test developed by the researcher of this study and a semi-structured interview form again developed by the researcher were used. For the analysis of the quantitative data collected in the study, the paired-samples t-test, one of parametric test techniques, was used. As for the analysis of the qualitative data, descriptive analysis was applied. The findings obtained in the study demonstrated that the active learning environment established using the programming environment of Scratch had significant influence on the students' achievements in the lesson unit of Simple Electric Circuits. In addition, according to the results, no significant difference was found between the attitude scale pretest and posttest mean scores. Lastly, the semi-structured interviews held with the students revealed that the active learning method carried out for the learners supported permanent learning thanks to the visual contents included, concretized and made learning entertaining and that teaching with the help of this method should be made common.

Keywords: Active learning, learning by doing and experiencing, self-learning, Scratch programming environment

1. INTRODUCTION

Recent rapid and fundamental changes in the field of information and technology have influence on education system as well. It is important to prepare students for life with new skills and competencies in the 21st century. Instead of traditional learning methods, which cause students to become passive in learning, the method of learning by doing, experiencing, which requires students to become active, and which supports the changes in students not only in cognitive and affective domains but also in the psychomotor domain, is now more prominent (Şen, 2001).

In one dissertation conducted by Aşiroğlu (2014) with 39 elementary school 5th grade students, the researcher examined the influence of activities based on active learning within the scope of the course of Science and Technology on their achievements and problem solving skills. In the study, which involved use of methods such active learning methods as problem solving, case study, educational games, project-based learning and creative drama, it was found that the experimental group, which the active learning approach was applied to, had significantly higher mean scores in the problem solving skills and achievement posttests when compared to the control group. In another study carried out with 64 8th grade students in a period of 10 weeks, Aydede and Kesercioğlu (2012) examined the participants' self-learning skills. In the study, the researchers reported that the applications based on active learning were positively influential on the students' self-learning skills. Another study investigated the effects of a learning environment enriched with active learning techniques on 121 5th grade students' academic achievements in and attitudes towards the course of Science and Technology (Türksoy and Taşlıdere, 2016). The analysis of the results obtained in the study revealed that the teaching method enriched with active learning techniques had significantly positive influence on the students' academic achievement in and attitudes towards the lesson unit of Electric in Our Lives.

The 21st century skills of problem solving, critical thinking, productivity, creativity and learning to learn are also among the target skills of the active learning theory (Kotluk and Kocakaya, 2015). Parallel to this, the curricula should be developed in a way to have students acquire these skills, and the methods and techniques to be used should serve this purpose. In line with this purpose, computational thinking is an effective approach which tries to develop individuals' problem skills by combining their critical thinking and creativity skills.

Current developing technologies not only influence all aspects of life but also cause great differences in the field of education. Coding, which has now become quite common parallel to the technological developments, provide those in the field of education with the opportunity to develop new instructional methods. It is thought that abstract concepts hard to understand can be taught more easily thanks to teaching with the help of programming. Concretization of abstract concepts helps students learn these concepts more easily and meaningfully (Akpınar, 2006). Studies carried out in the field of science teaching, which includes a considerable number of abstract concepts, demonstrate that physics subjects are considered by students to be abstract, complex and hard to understand and that many students thus suffer from failure in physics subjects and lack of motivation (Turgut, Karaman, Sönmez, Dilber, Şimşek and Altun, 2006; Bülbül, 2010). Technology-aided education, or computer programming, is fairly useful for

concretizing abstract science concepts as well as for presenting rich activities by ensuring students' active participation in learning (Akpınar, 2006).

Computer programming reminds of a difficult system involving complicated codes. However, if students make a scheme of the steps of a problem and obtain the related algorithm structure, then they will find the solution more easily. Tools like Scratch and Alice are used for various reasons such as concretizing the abstract algorithm process, allowing instant testing and providing the user with the opportunity to make corrections (Erol, 2015).

When compared to Alice using 3-dimension models, Scratch, which involves 2-dimension visuals easier to form and organize, has approximately 30 million users. Scratch, designed to encourage various types of projects, provides motivation and opportunities to learn from others (Maloney, Resnick, Rusk, Silverman and Eastmond, 2010). Genç and Karakuş (2011) conducted a study to determine the experiences and views of 109 students regarding the use of Scratch within the scope of the course of 'Designing Computer Games in Education'. According to the results, 73% of the participants found it easier to learn basic programming structures via Scratch than via other programming languages. In addition, the results of the student also revealed that use of Scratch in the course of programming, which the students found hard to learn and had low levels of academic achievement in, led to positive changes in the students' attitudes towards programming. Saygıner and Tüzün (2017), in their study, pointed out that abstract and complex concepts related to the programming language caused the students to have difficulty understanding the structure of programming. As a solution to this, the researchers suggested block-based visual programming environments like Scratch and reported that block-based visual programming had contributed positively to learning programming.

Ferrer-Mico, Prats-Fernàndez and Redo-Sanchez (2012), in their study, examined the influence of Scratch programming on students' self-learning skills. The study was carried out with two different groups of participants. The participants in one group were at starter level in Scratch programming, and those in the other were at advanced level. The results of the study did not reveal any significant difference between the two groups in terms of their self-learning skills However, the results demonstrated that the interactions encouraged learning.

In another study, Ouahbi, Kaddari, Darhmaoui, Elachqar and Lahmine (2015) aimed to teach basic programming concepts to the students using the Scratch software. The study was carried out with three groups of randomly selected 60 high school students. The students in the first group were taught programming with Scratch by creating simple games. The students in the other two groups were taught programming using traditional methods based on Pascal programming language. In the study, for the purpose of determining the students' levels in programming, their gaming habits, their motivations and their interests in programming, two questionnaires were distributed to the participants before and after the experimental process. The results of the analysis of the students' responses to the questionnaires demonstrated that use of Scratch for teaching programming motivated the students and increased their interest in learning programming. Also, the researchers suggested that creating games and stories could increase students' creativity to learn the fundamentals of programming.

In one other study, Erol (2015) aimed to examine the influence of teaching programming with Scratch on the students' motivation and achievement in programming. The study was conducted with two different groups of participants with 26 students in each. In the first seven-week

process, for the purpose of teaching basic programming structures, the students in the experimental group carried out game-design activities using Scratch, while those in the control group carried out problem solving activities using flow charts. In the second seven-week process of the study, the students in both groups were taught C# programming language, which is a real programming language for real-world tasks. The results of the analysis of the data collected with the data collection tools revealed that throughout the application process, there was an increase in the motivations of the students learning programming with Scratch and that there was a decrease in the motivations of the students in the control group. When the participants' achievements in programming were examined, it was seen that an increase in the achievements of both groups of students and that there was a significant difference in favour of the experimental group students learning with Scratch. At the end of the study, the experimental group students reported that it was easier and more entertaining to learn programming with Scratch, while those in the control group who learned programming using flow charts thought that the problem solving process was difficult and boring.

Kalelioğlu and Gülbahar (2014) carried out a study with 49 elementary school 5th grade students to examine the influence of Scratch programming on their problem solving skills. The results of the analysis revealed that Scratch did not cause any significant difference in the participants' problem solving skills. The results also demonstrated that the students found Scratch easy to use and that it helped the students enjoy programming.

Considering the results of all those studies mentioned above, it could be stated that Scratch is an effective visual programming language environment and that it helps students enjoy programming by making difficult and abstract aspects of programming easier, concrete and entertaining for them. In addition, use of Scratch could be said to contribute positively to students' attitudes, motivations and programming skills. Thanks to its user-friendly interface, Scratch allows designing games and thus makes learning entertaining. Also, as it concretizes the problem solving process, Scratch learning environment could be used as an effective tool in teaching science subjects including abstract concepts. Lastly, Scratch could help students avoid demonstrating negative attitudes to physics caused especially by abstract, complex and hard-to-understand physics subjects, and it could increase their motivation and thus their achievement in physics.

The present study is considered to be important since it allowed the students to produce simulations on their own to solve the given problems using the Scratch block-based programming environment. Thus, the students were provided with the opportunity to create their own learning environments. In this respect, an active learning environment was created for teaching the lesson subject of "Simple Electric Circuits". As required by this learning environment, the students were expected to achieve their own learning thanks to the coding in Scratch programming environment. The present study examined the influence of the active learning method on the students' academic achievements in and attitudes towards the physics lesson unit of simple electric circuits.

1.1 Research Problem and Sub-Problems

1) Does the active learning activity regarding the lesson unit of simple electric circuits in the undergraduate course of Physics on the students' academic achievements?

   a. Is there a significant difference between the students' pretest and posttest achievement scores?
   b. Do the achievement levels of the students carrying out the active learning activity differ significantly with respect to their gender?
2) What is the influence of the active learning activity regarding the undergraduate physics lesson unit of simple electric circuits on the students' attitudes towards the subject of simple electric circuits?
   a. Is there a significant difference between the students' pre-application attitudes and their post-application attitudes towards physics?
   b. Is there a significant difference between the students' pre-application and post-application attitudes towards physics with respect to their gender?
3) What are the students' views about the active learning activity carried out in relation to the undergraduate physics lesson unit of simple electric circuits?

2. METHODOLOGY

2.1. Research Model

The study was carried out with students from the department of Computer Education and Instructional Technologies (CEIT) within the scope of the course of Physics. The study aimed to determine the influence of Simple Electric Circuits applications designed by the participants themselves using the Scratch programming environment on their attitudes towards and achievements in the lesson unit of simple electric circuits. In the study, the qualitative and quantitative research methods were used together. The mixed method research design, which involves elements of both qualitative and quantitative approaches, basically assumes that a combination of qualitative and quantitative approaches helps understand a research problem better when compared to a single approach (Creswell, 2014).

In the study, involving both quantitative and qualitative aspects, the single-group weak experimental design with pretest and posttest, one of quantitative research approaches, was used. Experimental research designs aim to reveal the influence of the differences created by the researcher on the dependent variable for the purpose of testing the cause-effect relationship between the variables (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz and Demirel, 2014). As for the method called weak experimental design, the influence of the experimental process is tested on a single group using the same measurement tools (Büyüköztürk et.al., 2014).

2.2. Study Group

The research universe included students taking the undergraduate course of physics in the department of Computer Education and Instructional Technologies (CEIT). The research sample was made up of 24 CEIT 2nd grade students at Necatibey Education Faculty of Balıkesir University. Among the participants in the study, 16 of them were female (57,1%), and 12 of them were male (42,9%).

2.3. Data Collection Tools

In the study, Simple Electric Circuit (SEC) Attitude Scale developed by Taşlıdere and Eryılmaz (2012) was used to measure the students' attitudes towards the physics lesson unit of simple electric circuits. The SEC Attitude Scale was five-point Likert-type scale made up of 24 items rated as "I Completely Agree", "I Agree", "I am Neutral", "I Disagree" and "I Completely Disagree". The overall reliability coefficient of the scale was calculated as 0,93, and the reliability coefficients for the sub-dimensions were found to range between 0,81 and 0,91.

In order to measure the participants' levels of achievement in the physics lesson unit of simple electric circuits, the "Simple Electric Circuits Achievement Test" developed by the research was applied as pretest and posttest. This "Simple Electric Circuits Achievement Test" included 17 questions, and for the purpose of determining the content validity of these questions and their appropriateness to the students' levels or class grades, three field experts were asked for their views. In line with the experts' suggestions, the necessary corrections were done. In addition, this achievement test was piloted with 47 3rd grade students from the Department of Physics Education at Necatibey Education Faculty. As a result of the analysis conducted using SPSS, the Cronbach alpha reliability coefficient of the test was calculated as .566. The main reason why the test was found moderately reliable was that the students involved in the pilot application were taught the lesson unit of Simple Electric Circuits one year earlier. It could also be stated that the students participating in the pilot application might have forgotten what they had learned about the lesson unit of simple electric circuits. Therefore, for the test reliability, mostly the expert views were taken into account.

In the present study, for the purpose of determining the students' views both about their own learning and about the active learning application, a semi-structured interview form made up of five questions was prepared. In relation to these five questions found in the interview form, detailed sub-questions were prepared. Also, field experts were asked for their views, and in line with their suggestions, the necessary corrections were done in the form. As a result, a total of 30 questions were obtained. Before the interviews, the students were informed about the interview purpose and about how long the interviews would take. Among all the students taking part in the active learning applications, 16 volunteers were asked for their views about the process. The interviews held with the participants were audio-recorded, and prior to the interviews, the participants were asked for their consents. Also, the researcher took notes during the interviews.

2.4 Application Process

In the study, the purpose was to determine the influence of Simple Electric Circuits applications developed by the participants themselves using the Scratch programming environment on their attitudes towards and achievements in this subject. The study was carried out with students from the department of Computer Education and Instructional Technologies (CEIT) within the scope of the course of Physics in a total of nine course hours in three weeks.

In the three-week research process, an application was developed by the students regarding the subject of SEC in Scratch programming environment. In this three-week process, instead of asking the students to solve the given problems using the pen-and-paper method, they were taught the subject of SEC with the help of the simulations developed by the students themselves

via their own codings in Scratch programming environment. The students did not use the current ready-made simulations regarding the subject of SEC. Instead, they carried out their experiments on the simulations they developed themselves. In this way, they actually prepared their own learning materials themselves. In these applications, the situations they encountered in their real lives were selected as the problem cases (Battery connections of remote controllers, battery connections of watches and so on). The participants were in contact both with their peers and with their teachers throughout the process. In addition, at the end of the lessons, the summarization technique, in which the students briefly described what they had learned, was used. The purpose of using this technique was to provide the students with the opportunity to review the subject and the lesson content.

When the codings developed by the students within the scope of SEC using the Scratch programming environment were examined, it was seen that the students formed different structures for the same problems.

In the application, which involved calculation of the potential difference of a circuit with R1=25,5 and R2=32,3, there were differences between the solutions put forward by three students.

Figure 2.1: *Student-1's calculation of the potential difference.*

Figure 2.2: *Student-18's calculation of the potential difference.*

Figure 2.3: *Student-20's calculation of the potential difference.*

When the codings done by the students regarding the problems in Scratch environment were examined, it was seen that the numbers of sprites and costumes increased from the first

application developed to the last one and that the difficulty of the coding structure increased from the first application to the last one.

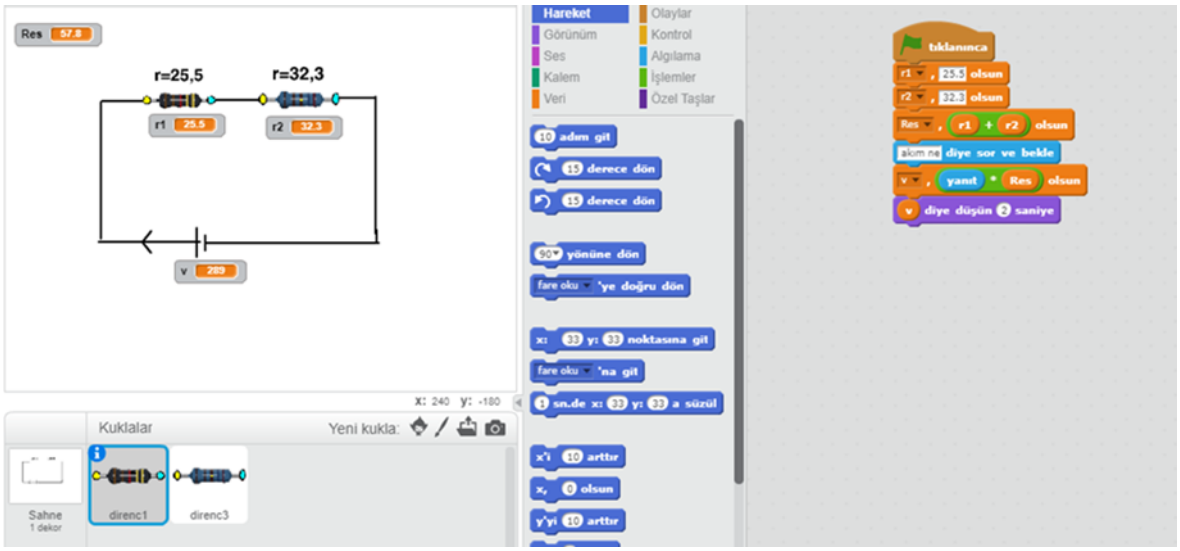

Figure 2.4: *The first application shared by Student-18.*

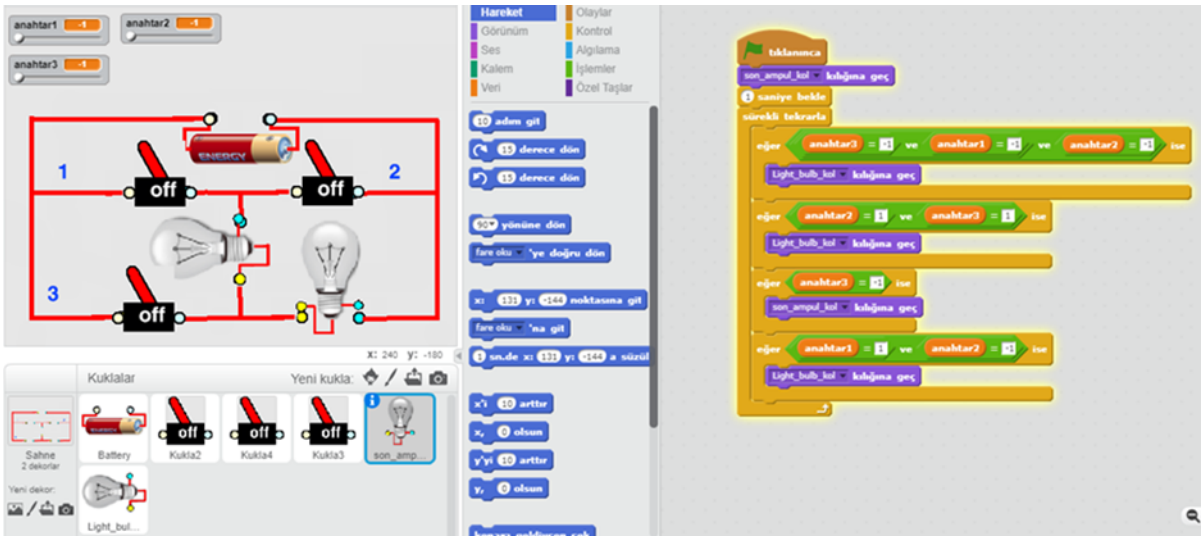

Figure 2.5: *The last application shared by Student-18.*

2.5 Data Analysis

In the study, the students' responses to the data collection tools were computerized. In this way, healthier and more correct results were obtained, and the results were analysed using SPSS 17.0.

In this study, normality was examined using the coefficient of skewness, histogram, normal Q-Q plot and Shapiro-Wilks test. The data obtained by examining the influence of the teaching method on the students' academic achievements demonstrated a normal distribution. Therefore, paired-samples t-test, one of parametric test techniques, was used to examine the difference between the SEC achievement scale pretest and posttest scores within the scope of the course of physics taught with the active learning method using the Scratch programming environment. In addition, the data collected via the examination of the influence of this teaching method on the students' attitudes towards SEC demonstrated a normal distribution; therefore, paired-

samples t-test, one of parametric test techniques, was used to examine the difference between the SEC attitude scale pretest and posttest scores within the scope of the course of physics taught with the active learning method using the Scratch programming environment. The paired-samples t-test can be used in survey studies or in experimental studies, in which two relational measurements or scores are obtained via the repeated measures of the same participants or from paired research samples (Büyüköztürk, 2016).
The qualitative data were obtained via the semi-structured interviews held with 16 randomly selected students. For the analysis of the participants' responses to the semi-structured interview questions, descriptive analysis was applied.

3. FINDINGS and DISCUSSIONS

3.1 Effects of the Development of an Application in Scratch Programming Environment on the Undergraduate Students' Academic Achievements in the Physics Lesson Unit of Simple Electric Circuits

Among the purposes of the present study was examining the influence of the students' development of an application regarding SEC in Scratch programming environment on their academic achievements within the scope of the course of physics. In line with this purpose, the SEC achievement test was applied to the students as pretest and posttest. The students' responses were divided into four groups: "correct=1,00", "operational mistake=2,00", "wrong=3,00" and "No answer=4,00". The sum of the scores for their responses to each question was calculated. As a result, the students with low scores were considered to be more successful than those with high scores. For instance, a student giving correct answers to all the questions was considered to be the most successful student with a total of 22 points receiving 1 point for each question (correct=1,00).

Tablo 1: SEC achievement scale Shapiro-Wilk normality test results.

Measurement (SEC Achievement)	Kolmogorov- Smirnov			Shapiro-Wilk		
	Statistics	df	p	Statistics	df	p
Pretest	,092	28	,200	,977	28	,769
Posttest	,091	28	,200	,966	28	,480

In the study, as the pretest p-value (α=.769) and the posttest p-value (α=.480) calculated for the SEC Achievement Scale were higher than α=.05, it was concluded that at this level of significance, the scores did not deviate excessively from the normal distribution and that the distribution was normal. As the data demonstrated a normal distribution, t-test, one of parametric test techniques, was used to examine the difference between the SEC achievement scale pretest and posttest scores within the scope of the course of physics taught with the active learning method using the Scratch programming environment.

Tablo 2: t-test results regarding the SEC pretest and posttest mean scores.

Measurement (SEC)	N	X	Sd	df	t	p
Pretest	28	67,68	8,22	27	4,48	.000
Posttest	28	59,68	9,53			

The results revealed a significant increase in the students' academic achievements thanks to the applications they themselves developed using the Scratch programming environment within the scope of the course of physics (p=.000<.05). It was found that there was no significant difference between the students' scores in the SEC achievement scale before the active learning activity carried out using the Scratch programming environment (p=.28>.05). In addition, it could be stated that following the activity, there was no significant difference between the students' scores in the SEC achievement scale with respect to the variable of gender (p=.87>.05).

Tablo.3: t-test results regarding the SEC pretest and posttest mean scores with respect to gender.

Measurement (SEC)	Gender	N	X	Sd	sd	T	p
Pretest	Female	16	69,31	5,29	14,89	1,12	0,28
	Male	12	65,50	10,89			
Posttest	Female	16	59,94	8,57	26	0,16	0,87
	Male	12	59,33	11,08			

3.2 Effects of the Development of an Application in Scratch Programming Environment on the Undergraduate Students' Attitudes towards the Physics Lesson Unit of Simple Electric Circuits

The study also aimed to examine the effects of examining the influence of the students' development of an application in Scratch programming environment on their attitudes towards SEC within the scope of the course of physics. In line with this purpose, the SEC attitude scale was given to the students as pretest and posttest. In order to determine whether the measurements demonstrated a normal distribution or not, Shapiro-Wilk test was applied. It was found that the SEC Attitude Scale pretest (p=.224>.05) and posttest (p=.624>.05) scores demonstrated a normal distribution.

Tablo.4: SEC Attitude Scale Shapiro-Wilk normality test results.

				Shapiro-Wilk		
Measurement (SEC Attitude)	**N**	**X**	**Sd**	**Statistics**	**df**	**p**
Pretest	28	3,57	0,47	,952	28	,224
Posttest	28	3,48	0,47	,972	28	,624

As the data demonstrated a normal distribution, t-test, one of parametric tests, was applied to examine the difference between the SEC attitude scale pretest and posttest scores within the scope of the course of physics taught with the active learning method using the Scratch programming environment.

Tablo 5: t-test results regarding the SEC attitude pretest and posttest scores.

Measurement (SEC Attitude)	**N**	**X**	**S**	**df**	**t**	**p**
Pretest	28	3,57	0,47	27	,830	,414
Posttest	28	3,48	0,47			

No significant difference was found between the students' SEC attitudes following the applications developed by the students themselves using the Scratch programming environment within the scope of the course of physics (p=.414>.05).

Tablo 6: t-test results regarding the SEC attitude pretest and posttest scores with respect to gender.

Measurement (SEC Attitude)	**Gender**	**N**	**X**	**S**	**df**	**t**	**p**
Pretest	Female	16	3,49	,37	26	-1,05	0,30
	Male	12	3,67	,57			
Posttest	Female	16	3,30	,42	26	-2,52	0,02
	Male	12	3,72	,43			

In the study, no significant difference was found between the students' scores in the SEC attitude scale with respect to their gender before the active learning activity carried out using the Scratch programming environment (p=.30>.05). In addition, it could be stated that following the activity, there was a significant difference between the students' scores in the

SEC attitude scale with respect to the variable of gender (p=.02<.05). When the mean scores obtained via the SEC attitude scale following the activity were examined, it was seen that the male students had a mean score of 3.72 and that the female participants had a mean score of 3.30. In other words, the male students had a higher levels of SEC attitudes after the activity when compared to the female students.

3.3 Students' Views about an Activity for Learning by Doing and Experiencing Regarding the Physics Lesson Unit of Simple Electric Circuits

The third research purpose was to determine the students' views about an activity for learning by doing and living regarding the lesson unit of simple electric circuits within the scope of the undergraduate course of physics. In order to reveal the students' views about this physics lesson taught with the active learning method using the Scratch programming environment, a semi-structured interview form developed by the researcher was used at the end of the application process. The interview form made up of five questions and related sub-questions was applied to 16 students selected among the participants on voluntary basis. For the analysis of the participants' responses to the questions in the semi-structured interview form, descriptive analysis was conducted. During the analysis of the data, the responses of each student were examined, and the similar views of the students were combined. Thanks to this, the students' common views were determined.

During the interviews, the students reported that the applications felicitated their understanding the lesson unit of simple electric circuit and that use of visuals to concretize the subject led to effective and permanent learning. Also, the students pointed out that there were important differences between active learning and the traditional method of learning. Among the students interviewed, Student-1's views were as follows:

"I don't like this course at all. Usually, I used to fail to understand what the teacher taught us, but with the help of these applications, we learn concretely. In this way, we can remember the subjects better."

Another student coded as Student-9 stated that:

"I think the method of active learning is better because I believe students will learn better with the help of visuals. I mean we learn by concretizing an abstract subject. In this way, it could be more permanent. For example, when the teacher shows an application, we do it. This is very important in learning. This method is better for me than the traditional method."

During the interviews held after the applications, the students reported that the process was entertaining and that the applications increased their interest in the lessons. One of the students, Student-16, said:

"The computer-aided educational applications are more entertaining than the traditional method. I already like spending time on computer; thus, I have found this method more enjoyable. In the traditional method, I sometimes get bored, but when use the computer, I entertain more thanks to the visuals while doing the applications myself."

4. CONCLUSION and SUGGESTIONS

In literature related to the active learning method, there are several studies which revealed that teaching courses with the help of the active learning method increased the learners' academic achievement and which reported learners' positive views about this model (Aydede and Matyar, 2009; Akşid and Şahin, 2011; Büyükbayraktar Ersoy, 2015). Similar to the results obtained in these studies, the present study demonstrated that the active learning method allowed learners to structure their own knowledge (Büyükbayraktar Ersoy, 2015). In addition, Aşiroğlu (2014)

the students taught using activities based on active learning had high levels of problem solving skills than those who did not use these activities.

Different from the studies carried out using the active learning method in related literature, the Scratch programming environment was used to prepare an active learning environment in the present study. In literature, there are several studies examining the effects of the Scratch programming environment on learners' levels of programming, their gaming habits, motivations, achievements in programming, achievements in other fields, interests in lessons, problem solving skills and on their self-learning skills.

According to the data obtained via the semi-structured interviews held individually with the students, it was found that the applications carried out using the Scratch programming environment within the scope of the course of Physics contributed to the students' programming skills. Erol (2015), who examined the influence of teaching programming with the help of Scratch on students' motivations and achievements in programming, pointed out that the students' experiences in the process of designing games using Scratch contributed to their achievements in programming in the process of learning the C# programming language, which is said to include abstract concepts. In addition, Ouahbi and colleagues (2015), who aimed to teach students basic programming concepts using the software of Scratch, found that use of Scratch for teaching programming motivated the students and increased their desire to maintain their studies.

In the present study, the learners' problem solving skills were not determined experimentally, but it was revealed that the learners developed algorithms appropriate to the problems related to simple electric circuits which they were likely to encounter in their real lives. Similarly, there are various studies in related literature which examined the influence of Scratch programming on learners' problem solving skills. Vatansever (2018), who examined the influence of teaching programming with Scratch on students' problem solving skills and evaluated their views about this process, suggested designing games to teach programming with Scratch as an alternative method for training students with problem solving skills. On the other hand, Kalelioğlu and Gülbahar (2014), in their study, investigated the influence of Scratch programming on students' problem solving skills and concluded that the Scratch environment did not cause any significant difference in the students' problem solving skills.

Based on the results presented in the section of findings, it could be stated that this active learning study integrated with the use of the Scratch programming environment, one of block-based visual programming languages, supported the findings regarding the active learning method reported in related literature that lessons taught with the active learning method increased students' academic achievements.

When the SEC achievement test results were examined, it was seen that there was a statistically significant difference between the pretest and posttest results ($p=.000<.05$). The students' SEC pretest achievement mean score was $X=67,68$, their posttest achievement mean score was $X=59,68$. The students' responses were divided into four categories as follows: "correct=1,00", "operational mistake=2,00", "wrong=3,00" and "No answer=4,00". While calculating the students' scores, the sum of the scores for their responses to each question was calculated. Based on this calculation, the students with the lowest score were considered to be more successful than those with high scores. For example, a student giving correct answers to all the questions was considered to be the most successful student with a total of 22 points receiving 1

point for each question (correct=1,00). This shows that the active learning environment created by using the Scratch programming environment had considerable influence on increasing the students' SEC achievements. This result provides an answer to the first research question directed in the present study: "Is there a significant difference between the students' academic achievements before and after the active learning activity regarding the Physics lesson unit of simple electric circuits?".

When the students' scores in the SEC achievement scale before the active learning activity carried out using the Scratch programming environment were examined, it was seen that there was no significant difference between the results with respect to the variable of gender ($p=.28>.05$). In addition, when the scores obtained via the SEC achievement scale following the activity were examined, no significant difference was found between the results with respect to the variable of gender ($p=.87>.05$). This result provides an answer to another research question directed in the study: "Do the achievement levels of the students carrying out the active learning activity within the scope of the Physics lesson unit of simple electric circuits differ significantly with respect to their gender?".

In the study, no significant difference was found between the students' pretest and posttest scores in the SEC attitude scale regarding the course of Physics in which they carried out their own applications using the Scratch programming environment ($p=.414>.05$). This result provides an answer to the research question of "Is there a significant difference between the students' attitudes towards the lesson unit of simple electric circuits before and after the active learning activity carried out within the scope of the undergraduate course of Physics?".

In the present study, which investigated the influence of active learning on undergraduate students' attitudes towards the physics lesson unit of simple electric circuits, semi-structured interviews were held with the students. During these interviews, the learners reported that teaching lessons with this method was more interesting and entertaining and that they participated more in lessons. In related literature, a similar result was reported by Kalelioğlu and Gülbahar (2014), who examined the influence of Scratch programming on elementary school 5th grade students' problem solving skills and found that the students considered Scratch programming environment to be easy and that thanks to this environment, the students began to enjoy programming.

Based on the results of the analyses and interviews, it could be stated that physics lessons taught using the Scratch programming environment became more entertaining and permanent when compared to the traditional method of teaching. In addition, associating CEIT students' field courses with other disciplines could allow students to produce more creative ideas regarding the probable situations they would face in their future professional lives.

Suggestions for Practice

- In order to help understand courses like Physics, which include a number of abstract concepts, activities like designing games by using Scratch, Alice or other similar visualizers could be carried out.
- For the purpose of increasing students' achievements and motivations by helping them understand abstract concepts more easily, learner-centred learning environments could be designed for the course of Physics.

- This active learning activity carried out in Scratch programming environment could be carried out with more students under similar conditions. Students at the same class grades but at different schools could be taught lessons using this method.
- While teaching courses which include a number of abstract concepts, learning environments which allow learners to learn in cooperation with each other and which encourage them to conduct research could be designed to increase their achievements and motivations.
- In order to help students understand the abstract concepts easily within the scope of the course of Physics, game design activities could be carried out in physics lessons using Scratch or other similar visualizers for different age groups ranging from elementary school level to university level.

Suggestions for future Studies

- Future studies could use different visualizers instead of Scratch within the framework of an active learning activity that students carry out by designing their own applications while learning SEC within the scope of the course of physics,
- For the purpose of investigating the influence of active learning activity carried out with Scratch on learners' motivations and achievements in the physics lesson unit of simple electric circuits, similar studies could be conducted with students from different education levels including secondary school students, high school students and university students.
- The activity could be carried out again with a higher number of participants.
- The influence of the Scratch coding activities using while teaching the physics lesson unit of simple electric circuits on learners' motivations and achievements in other programming courses could be investigated.

Aktif Öğrenmenin Lisans Öğrencilerinin Fizikte Basit Elektrik Devreleri Konusundaki Başarı ve Tutumlarına Etkisi

Özet

Bu çalışmada yaparak yaşayarak öğrencinin bilgiyi kendisinin yapılandırmasını sağlayan aktif öğrenme yönteminin fizik dersi basit elektrik devreleri konusundaki başarı ve tutumuna etkisi incelenmektedir. Araştırma bir devlet üniversitesinin Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümünde öğrenim gören 28 öğrenci ile Fizik dersi Basit Elektrik Devreleri konusu kapsamında testlerin toplanma süreci dâhil olmak üzere 5 haftalık süre boyunca yürütülmüştür. 3 hafta toplam 9 saat uygulama sürecinde Basit Elektrik Devreleri konusu, öğrencilere verilen problemlerin çözümü için Scratch programlama ortamında kendi kodlamalarıyla geliştirdikleri simülasyon benzeri etkinlikler aracılığıyla öğretilmeye çalışılmıştır. Çalışmada veri toplama aracı olarak Erdal TAŞLIDERE ve Ali ERYILMAZ tarafından geliştirilen "Basit Elektrik Devreleri Konusuna Yönelik Tutum Ölçeği", araştırmacının geliştirdiği Basit Elektrik Devreleri Başarı Testi ve yarı yapılandırılmış görüşme formu ile veriler toplanmıştır. Araştırmada elde edilen nicel verilerin analizinde parametrik test tekniklerinden ilişkili t-testi, nitel verilerin analizinde betimsel analiz kullanılmış tır. Çalışmada elde edilen bulgular neticesinde Scratch programlama ortamı kullanılarak gerçekleştirilen aktif öğrenme ortamının, öğrencilerin Basit Elektrik Devreleri başarılarını artırmada önemli etkiye sahip olduğu, tutum ölçeği ön test ve son test puanları arasında anlamlı bir farklılık olmadığı görülmüştür. Yarı yapılandırılmış görüşmelerde öğrenenlerle gerçekleştirilen aktif öğrenme yönteminin görsel içerikler barındırarak kalıcı öğrenmeyi desteklediği, öğrenmeyi somutlaştırdığı, eğlenceli hale getirdiği ve bu yöntemle ders işlenmesinin yaygınlaştırılması gerektiği sonuçlarına ulaşılmıştır.

Anahtar kelimeler: Aktif öğrenme, Scratch programlama dili, kendi kendine öğrenme, yaparak yaşayarak öğrenme

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Examining Mooc Videos in Terms of Learning Theories

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Research Article

Abstract

The purpose of this study is to reveal the learning theories based on the videos on different MOOC platforms. Videos in this context were examined in terms of the nature of the information, the role of the teacher, the role of the student, learning, learning and teaching type, teaching strategies, educational environments and evaluation variables. The data were analyzed by descriptive analysis method and quantitative research method was used to analyze MOOC video contents. The behavioral learning theory was found to be predominant in the videos in the five MOOC sites examined. In addition, some variables were found to be based on cognitive learning theories.

Keywords: Massive online open courses (MOOCs), learning theories, distance learning, online courses

1. INTRODUCTION

Although the history of open and distance learning is based on older sources in some sources, it is assumed that the first practices started with the correspondence study method in the 19th century (Aydın, 2011). The developments such as the rapid development of technology in the twentieth century, the expansion of the radio and television as well as the introduction of

computers to the end of the century have diversified and facilitated the application areas of open and distance learning activities.

Diversity in this area has made it easier for people to reach open and distance learning and for it to spread among people. Again, this process of development and diversity led to different definitions of open and distance learning in the literature.

Aydın (2011) in his study combined the common points of the definitions of Simonson and others on a definition: Open and distance learning is a learning process in which learners are remote from each other and from learning sources in the context of time and / or space, and their interactions with each other and learning resources are based on remote communication systems.

Although the concepts of open education and distance education are often used interchangeably, the concepts of open and remote in the above definition point to different characteristics. Tella (1997) explains the concept of openness as the necessity of giving flexibility and choice for learners, while explaining the concept of distance by pointing to the independence of learners as learning time and / or space.

Depending on the technological possibilities of the period, letter, radio, television, computer and internet technologies were used in distance education (Aydın, 2011). In the early 21st century, the development of computer and internet technologies accelerated the development of new learning environments that could be used in distance education. One of these learning environments is MOOCs which are used in mass education.

2. LITERATURE REVIEW

The courses offered in MOOCs consist of different types of content according to the needs of the fields. One of these content types is video. Although there is a lot of research about the MOOC systems in the literature, it is seen that the researches on the learning theories used in the videos are insufficient. Previously, Bozkurt (2013), Bozkurt (2015) and Ergüney (2015) conducted a study on MOOCs, but the aspect of videos used in these studies did not address directly the learning theories. In this context, in the current study, 38 distance education platforms were examined in the world and related course content was found in 5 platforms and the videos used in Mooc platforms were evaluated in terms of learning theories. In addition, in order to determine the current situation in MOOC platforms, selected MOOC videos were examined in terms of learning theories and the learning theories used in the videos were determined. Considering that these determinations can contribute to the selection of appropriate learning theories for instructional designers who prepare content for these platforms, this study can be claimed to be important for distance education field. It is thought that in the light of the results of this research, higher quality teaching designs can be developed and learners can access more efficient Mooc video contents. This research is one of the first original studies to examine learning theories preferred in MOOC videos.

The distance education process, which was started with a letter in the 19th century in the USA, was first developed in the form of sending postal course materials to the learners, then gained importance in terms of technology integration with the use of radio and then television

and hence took its current form with the use of computer and internet technologies. One of the most widely used internet technologies today is 'MOOC'. MOOC stands for Massive Open Online Course. This system is an open and free online platform where various courses are taught, these courses are mostly transferred by video, the number of participants can be thousands or even more massive (Bozkurt, 2015). These courses can be paid or free, depending on the platform's choice of pricing and the services offered by the platform. The courses offered in the MOOCs may include occasional tests or assignments, as well as forums where the learners can communicate with each other.

The word “massive”, which stands for MOOC stands for a large amount of learners. Thanks to online platforms, a large amount of people can get the same lesson at the same time which is not possible through formal education. The word “open” emphasizes that the online courses are accessible to anyone who wishes. Learners from all over the world can register to any platform they want at any time, spending as much time as they want. To participate in such online platforms, it is usually enough to have only a valid e-mail address. The Word “online” underlines that courses are delivered to learners through the Internet using information and communication technologies. The last word, “courses”, states that the lessons on these courses are not random but are carried out within the framework of a specific academic plan and program and pedagogical basis. MOOC platforms allow the learner to maintain their professional and personal development for life without restricting them according to any criteria such as their age, profession, past lives, etc. MOOCs are comprehensive enough to provide education in various fields from engineering to sociology, medicine to philosophy, foreign languages to dance and music (Ergüney, 2015).

According to Siemens, there are two types of MOOCs. The first one is c-Massive Open Online Courses (cMOOC), which was started in 2008 by Siemens in the framework of the Connectivisim approach. The other type is usually x-Massive Open Online Courses (xMOOC), such as Coursera and edX, which are run by large institutions and have large financial budgets (Siemens, 2012b). cMOOC is the abbreviation of connectivist MOOC; whereas xMOOC is used as an abbreviation for extension MOOC. Also recently, Hybrid MOOC (Hybrid MOOC) has begun to emerge, offering cMOOC and xMOOC models in combination or in parallel, adopting a mixed learning approach and addressing a wider range of participants. c- Massive Open Online Courses adopt creativity, autonomy and social networks and adopt a connected approach; x- Mass Open Online Courses offer content using tools such as video presentations, quizzes and prefer traditional learning approaches (Bozkurt, 2013).

MOOC is a training system that is being implemented under the leadership of Massachusetts Institute of technology (MIT) and Harvard universities. The first examples of MOOC are presented through pioneering organizations' own platforms, but today there are more centralized platforms. edX is the MOOC platform founded by MIT and Harvard. edX is a pioneer platform in this field, with the participation of many universities such as Berkeley, Boston and UBC. The University of People, which opens higher education programs and gives university degrees with massively open online courses, is an independent and remarkable MOOC platform. Khan Academy, Iversity, Udacity and Alison are among the

major MOOC platforms. The MOOC platform providers listed in scholarly publications are presented in Table 1.

Table 1. MOOC Platform Providers Listed in Scholarly Publications

ALISON Canvans Network Class2Go Connexion Coursera CourseSties CourseSmart Desire2learn Digital Education edX Eliademy Ewant Futurelearn Google Course Builder	İVersity JMOOC Khan Academy Platform Mechanical MOOC MERLOT MiriadaX Mit OCW MITx Moodle NovoEd OERGlue Open University Open2study OpenLearn	Open Study OpenUpEd P2PU Peer-to-Peer University Saylor Foundation Schoo Udacity Udemy UniMOOC Veduca WEU Wikieducator XuetangX

Source: (İkinci, 2016, as cited in Peterson, 2014; Radford et al., 2014).

2.1. What are the benefits of MOOCs?

The benefits of MOOCs according to the MOOC Guide site are: wherever there is an internet connection, there is a possibility of getting education, the chance to get education in the mother tongue, the opportunity to choose between many course materials and materials, it is independent from time and place, easy and fast course preparation, sharing and reusable course materials, providing an informal learning environment, enhancing education by supporting the interaction between the learners, the lack of prerequisite for education and the freedom to choose the institution providing education, the possibility of having high-quality education either for free or for a low-price, individual learning at his own pace and supporting lifelong learning.

2.2. Learning Theories

Since each of the learning theories best describes a different type of learning, no learning theory is sufficient to explain and solve all learning types and all learning problems. For this reason, program development studies and teaching process should take advantage of the principles in each theory group according to the type of learning, the characteristics of the students and the type of knowledge learned (Senemoğlu, 2012). In the process of instructional design, there is a need for teaching theories that will guide designing the teaching-learning activities as well as the learning environment (Şendağ, 2016).

2.2.1 Behavioral Approach

In the first half of the twentieth century, behavioral theory, which dominated the field of learning, explained learning through observable and measurable changes in behavior (Gagne & Brings, 1985). According to behaviorists, learning occurs as a result of a bond between stimulant and response (Skinner, B. F., 1971). Small steps, individual speed, one-to-one teaching, concordance and reinforcement are the main principles of behavioral theories. (Schunk 1996, Akt: Caglar, Erdem, 2017). It is not important whether the organism is a human-being in behaviorism, because it is considered that the desired result can be achieved if the basic principles are applied. The process and the results are the most significant issues in this approach (Özer, 2005, p.106). It has been applied frequently in distance education due to advantages offered by behavioral approach such as providing education to large groups in a short time, being clear of teaching objectives, having measurable learning outcomes, giving learners the opportunity to learn at their own pace and teaching low cognitive skills effectively (Çakmak, Taşkın, Kokoç, 2017). Behavioral theorists believe that behavioral change occurs through classical conditioning, operant conditioning and observation. Behavioralism has been the main theory that was initially dominant in distance education processes and that led to the emergence of the theories in distance education (Moore Kearsley, 2012).

2.2.2. Cognitive Approach

The focus of learning theory is to understand how human memory works to get information and promote learning. Learning depends on students' specific strategies; planning, monitoring, evaluation and the impact of prior knowledge, beliefs, attitudes and values on learning define the focus point here (Tennyson and Schott, 1997). This theory more clearly shows how information is processed and saved, as well as how it is stored in memory structures to retrieve the previous information. Robert Gagne (1985) proposed nine learning events corresponding to specific cognitive processes. Nine learning events (Gagné 1985) are as follows: gain attention of the learners, inform the learners of the objectives, encourage the recall of previous learning, present existing stimulus content, provide learning guidance, elicit performance, provide feedback, asses the performance, ensure that it is memorable and improve the transfer (Stavredes, 2011). Gagne has shown that these nine events provide the learning conditions that reveal the intellectual skills that need to be learned and define the teaching sequence. He believed that the classes would be organized according to these activities so that the students could relate the new information to the existing structures. He also thought that he could provide the appropriate building level to support learning (Slavich and Zimbardo, 2011). This approach includes the role that teachers can play in changing students 'attitudes, values, and beliefs, as well as examining students' responsibilities in shaping the learning experience of themselves and their peers. It is thought that students should be able to read, write, discuss and engage in problem solving in order to maximize their intellectual development potential (Bonwell and Eison, 1991; Meyers and Jones, 1993; Svinivki and McKeachie, 2011). Cognitive learning theorists believe that learners do not only withdraw information from the environment or do not simply respond to external stimuli (Cahyadi, 2007). They actively participate in mental studies to understand what they

experience. They seek information to satisfy their curiosity, reconstruct their knowledge in the light of new information and change their behavior accordingly (Sawyer, 2014). The transition from a traditional face-to-face class to an online learning environment requires that the object that focuses on students' learning be considered content or teacher-centered. From the instructional transfer model on providing information to instructors on instructional design, the teacher made progress on the transition to a learning-centered model where the teacher actively guided students in creating a material understanding (Gunderson, 2009). In the form of a complex learning process, the process order is dealt with in the form of reasoning, solving the problem, processing the information, effectively transmitting / transmitting the information. Learning outcomes that focus on complex higher learning levels, such as problem solving, are best explained by cognitivism because the focus is on the content to be learned in advance to break up complex problems into their components and build a higher level of understanding.

2.2.3. Constructive Approach

The constructive approach has emerged as a result of many ideas and theories in order to overcome the deficiencies in teaching-oriented processes and to make the learning process permanent. The basis of the approach is that the learner configures and puts into practice what they learn, not the repetition of knowledge, but the transfer and restructuring of knowledge (Özkan, from Perkins, 2012). Instead of teacher directly giving the knowledge to the learner, the learner must be in pursuit of knowledge. During the process of constructing and constructing, the learner plays an active role and the teacher only acts as a guide in this process. When the learners have an active role, their learning becomes more permanent and they can create experiences in real life. In constructive approach, the student does not pass on the transferred information to his / her mind. Students learn by interacting with their active efforts and environment.

The student actively takes the knowledge through the activities such as inquiry, problem solving, connects with the works, pre-knowledge, adds his / her own comments and places them in his mind. The student learns through his active efforts, no one can teach him. Learning is done by the learner and no one can replace him. Learning is in control of the learner. S/he makes decisions about learning her/himself. The learner gives directions to the learning together with his/her teacher (Basque, 1999, Labédie and Guy, 2001, Güneş, 2010).

The prior learning of the learners in constructivist approach always plays a key role. New information is added to the previous information and the meaningful integration of this information with each other is necessary for the permanence of learning. The integrity achieved by the parts of information that are added together must be meaningful. The soundness of the structure depends on the interrelation of all information.

Constructivist can be summarized as follows (Savaş, 2007, as cited in Zorillo, 2000):

- Information is configured by the learner.
- Learning takes place depending on the general content of the learner.
- Information is created by the individual and influenced by culture.

- The new process takes place in an effective process. Copying the content directly from the program and presenting passive information is out of question. The effective process starts when the student sees the difference between the knowledge about the subject and his / her own information.

The Constructivist approach, in which the learners play an active role and the instructors monitor the educational processes as a guide, conducts a learner centered teaching. Within this dynamic processes, learners have permanent and meaningful learning.

3. METHOD

In this study, descriptive research method, which is a non-experimental research design, was used to examine videos used in Massive Open Online Course (MOOC) which is an extension of open and distance education. Descriptive study is a type of study that aims to present the current existing situation. In addition, quantitative method was used in the study because the features used in the video content were examined and analyzed numerically with the help of a checklist. The research process consists of the following steps: (1) Determining the scale; (2) determination of MOOCs; (3) Deciding which videos to be examined in designated MOOCs; (4) Testing of videos according to scale; (5) Arrangement and interpretation of the findings.

3.1. Purpose and Scope of the Study

The main purpose of this study is to reveal the learning theories based on the video content used in MOOC platforms. In this context, videos were examined in terms of the nature of the information, the role of the teacher, the role of the student, learning, learning and teaching, teaching strategies, educational environments and evaluation variables. It was decided that the content to be studied was basic mathematics and in this context; 38 MOOC platform providers given in Table 1 were examined and only 6 of them (Saylor, Khan Academy, FutureLearn, Alison, edX and Udemy) were found to be related to basic mathematics. The content of one of the platforms (Udemy) was not included in the study since it was not free at the time of research. For this reason, 5 MOOC platforms were used in the study. These; Saylor, Khan Academy, FutureLearn, Alison and edX.

3.2. Data Analysis

In order to examine and evaluate the videos, 3 different scales including basic outcomes of learning theories were examined and the scale developed by Schurman (1998, as cited in Deryakulu, 2019) with the common opinion of 10 researchers in the evaluation of Mooc videos was used for the purpose of checklist. The scale is arranged in the form of a matrix consisting of 3 items in the vertical and 9 items in the horizontal orientation. Behavioral behavioral, cognitive and constructivist theories are included in the vertical, while the features of these theories are horizontal.

Table 2. Source: Schurman, 1998 akt. Deryakulu, 2001: 67.

Key Elements	**Behavioral**	**Cognitive**	**Constructivist**
Nature of Information	Based on objective reality, independent of a specific person	Based on objective reality, dependent of a specific person	Based on individual and socially constructed subjective reality
The Role of the Teacher	Transfering information	Managing information acquisition process	Helping students, collaborating
The Role of the Student	Passive	Semi-active	Active
Learning	Change in open behavior as a result of conditioning	Processing information	Individual discovery and configuration of information
Learning Type	Separation, Generalization, Association, Chaining	Processing information in short-term memory, storing in long-term memory	Problem solving based on real situations
Type of Education	Inductively	Inductively	Deductively
Teaching Strategies	Presenting information, practicing, giving feedback	Stimulate the student's cognitive learning strategies	Effective, self-controlled, internal motivated, researcher learning
Educational Environments	Various traditional environments, (programmed-instruction, computer-assisted etc.)	Teacher and computer based teaching	Interactive environments that require students to demonstrate physical / mental responses to progress
Evaluation	Separate from the teaching process and based on criteria	Separate from the teaching process and based on criteria	Within the learning process and independent of the criterion

During the analysis of data, videos were examined separately by 10 researchers using the checklist. The investigations were checked by an expert in the field, the missing or mistaken parts were corrected, then the matrix results were analyzed and the research findings and comments were obtained through the collaboration of the researchers.

4. RESULTS

The results of the analyzes of the videos examined in this section are discussed under the nature of the information, the role of the teacher, the role of the student, learning, type of learning, type of teaching, teaching strategies, educational environments and evaluation headings.

4.1. Nature of Information

Table 3. The Nature of Information

Source	Behavioral	Cognitive	Constructive
Alison	1		
Khan Academy	1		
FutureLearn	1		
edX	1		
Saylor Academy	1		

Table 3 shows the results of the course videos in the five different MOOC platforms in terms of the nature of the information. In terms of the nature of information, it was seen that the approach in each platform is based on behavioral theory and did not include cognitive and constructivist theories. In all of the educational platforms examined, behavioral theory based on objective reality, which is independent of a specific person, was chosen. This result shows that there is a general tendency for educational platforms to choose behavioral theory as a single source in terms of the nature of information, while it indicates that they lack any contributions in terms of cognitive and constructivist approaches. It can be envisaged that the platforms should consider cognitive and constructivist theories as new perspectives for future MOOC preparation studies and include those in their studies.

4.2. The Role of the Teacher

Table 4. Role of Teacher

Source	Behavioral	Cognitive	Constructive
Alison	1	1	
Khan Academy	1		
FutureLearn	1		
edX	1		
Saylor Academy	1		

As can be seen in Table 4, when the educational videos were examined in terms of the role of the teacher, it was determined that the role of the teacher in all the platforms examined was information transfer. Except for one platform (Alison), it was seen that behavioral theory was used as a base in all studied platforms (Khan Academy, FutureLearn, edX, Saylor). Considering the fact that the examined platforms are very popular, it can be said that the constructivist approach is not preferred for the role of the teacher.

4.3. The Role of the Student

Table 5 shows the results of the students' role in five different MOOC videos.

Table 5. The Role of the Student

Source	Behavioral	Cognitive	Constructive
Alison	1	1	
Khan Academy		1	
FutureLearn	1	1	
edX		1	
Saylor Academy	1		

Looking at the results, the two platforms (Alison, FutureLearn) enriched their MOOC videos using both behavioral and cognitive approaches. The results of the platforms show similar results between the behavioral and cognitive approaches in terms of the student's role. The lack of the usage of constructivist approach provides a research area for educational platforms.

4.4. Learning

Table 6. Learning

Source	Behavioral	Cognitive	Constructive
Alison		1	
Khan Academy	1		
FutureLearn	1	1	
edX	1	1	
Saylor Academy	1	1	

As shown in Table 6, in order to provide instruction in the videos examined, the open change in behavior as a result of conditioning and the methods of processing the information were

used which includes the behavioral and cognitive approaches of learning together. This result is in line with the type of learning and the type of teaching results.

4.5. Learning Type

Table 7. Learning Type

Source	Behavioral	Cognitive	Constructive
Alison	1	1	
Khan Academy	1		
FutureLearn	1	1	
edX	1		
Saylor Academy	1		

When the data given in Table 7 were analyzed, it was seen that the behavioral approach was used as a base in terms of the learning type in all of the videos in the related MOOCs. In addition, two of the 5 videos examined (Alison and FutureLearn) were enriched in terms of their types of learning by using a cognitive approach as well as a behavioral approach.

4.6. Type of Education

Table 8. Teaching Type

Source	Behavioral	Cognitive	Constructive
Alison	1	1	
Khan Academy	1	1	
FutureLearn	1	1	
edX	1	1	
Saylor Academy	1	1	

Videos included in the sampling were examined in two groups as inductive and deductive in terms of teaching type. The method based on inductive expression, ie, from the parts to the whole, is appropriate for the teaching activities of both Behavioral and Cognitive approaches. The deductive method is more appropriate to the teaching activities of the Constructivist approach because it expresses the environments in which the subject is told from the whole to the parts. As shown in Table 8, the Inductive method was preferred in the videos examined. Deductive teaching method, which is more suitable for constructivist approach, was not preferred as the teaching type in the videos studied.

4.7. Teaching Strategies

In the matrix used for research, Behavioral teaching strategies were given as: presenting information, practicing and giving feedback; Cognitive teaching strategy was given as; stimulating student's cognitive learning strategies while Constructivist teaching strategies were listed as: active, self-controlled, internal motivated, researcher learning. The findings on the teaching strategies in the contents of the five MOOCs platforms examined are shown in Table 9.

Table 9. Instructional Strategies

Source	Behavioral	Cognitive	Constructive
Alison	1		
Khan Academy	1		
FutureLearn	1	1	
edX	1	1	
Saylor Academy	1		

When we look at the findings in Table 9, it is seen that behavioral teaching strategies were predominantly used in the contents. Only two MOOC platforms (FutureLearn and edX) had both behavioral and cognitive teaching strategies. Constructive teaching strategies were not encountered in the contents.

4.8. Educational Environments

Table 10. Educational Environments

Source	Behavioral	Cognitive	Constructive
Alison	1		
Khan Academy	1	1	
FutureLearn	1	1	
edX	1	1	
Saylor Academy	1		

The courses developed using Alison and similar MOOC platforms such as Khan Academy, FutureLearn, edX were based on cognitive-behavioral pedagogy with some minor components. The role of teacher was similar to face-to-face teaching and the courses were structured to have a specific content and a specific set of goals each week. As a result, the

interaction between students and teacher was limited. Web and social constructivist technologies facilitate the learning of useful information and establish cognitive connections. In the behavioral approach, when we consider primarily the observable, measurable behaviors instead of mental processes, we can see traces of observable behavioral approach related to learning in the courses.

4.9. Evaluation

Table 11. Evaluation

Source	Behavioral	Cognitive	Constructive
Alison	1	1	
Khan Academy	1	1	
FutureLearn	1	1	
edX	1	1	
Saylor Academy	1		

When we look at the findings in Table 11, it is seen that the majority of the content in the examined videos were based on a non-process-based and criterion-based evaluation in accordance with the behavioral and cognitive approach. In a behavioral and cognitive approach, students are tested to determine if the students have reached the learning outcome (Moedritscher, 2006). On the other hand, no independent assessment, which would be in accordance with the constructive approach, was observed in the learning process.

5. CONCLUSION, DISCUSSION

The use of MOOCs, in other words, massively open online courses in educational environments is becoming more and more common, and different platforms are emerging each day. Videos are widely used in MOOC platforms to enhance learners' interaction and enrich educational environments. In this study, a research was conducted with the scale chosen to determine the learning theories used in the online videos used for educational purposes.

Within the scope of the study, 38 MOOC provider platforms listed in Table 1 were examined one by one and scanned in the framework of the determined subject. The content of the 6 related platforms were found related. Access, as stated in the MOOC definition, was open and free, but access was not free on one of the platforms at the time of the study. In this study, only completely open and free platforms were utilized. In the 5 MOOC sites examined for this study (Saylor, Alison, edX, FutureLearn, Khan Academy), behavioral approach was revealed to be predominant in videos about basic mathematics education. In addition, it was also observed that the teaching was often supported by cognitive approach. It was found out that

knowledge was based on objective realism, that the teacher was transmitting knowledge, and that the learners were passive or semi-active. It was observed that the learning type was separational, generalizing, associating, chaining and hence, teaching was mostly inductive. The mainly used teaching strategies were providing information, practicing and giving feedback. Moreover, it was thought that the distance between teacher and student could be the reason behind the fact that evaluations in MOOC platforms were not independent assessments within the education process. No constructive approach was encountered in the investigations and the reason to this was thought to be that the MOOCs were addressing to a broad audience and that the trainings were being conducted asynchronously.

This study, which was conducted to examine MOOC videos in terms of learning theories, can be repeated using different parameters. The new findings can be compared to the results of the present study and a more comprehensive evaluation can be made for the platforms. It is recommended to the researchers who will examine in the same subject area to change the parameters such as selected MOOC platforms, subject of the videos examined, the number of investigators and the evaluation criteria and repeat the current research with those different parameters. The increase in the number of similar studies may contribute to the instructional designers who prepare content for MOOC platforms to choose the appropriate learning theory for the course content and to develop higher quality teaching designs.

Mooc Eğitim Videolarinin Öğrenme Kuramlari Açisindan İncelenmesi

Özet

Bu çalışmada, MOOC platformlarında kullanılan videoların dayandığı öğrenme kuramlarını ortaya koymak amaçlanmıştır. Bu kapsamda videolar; bilginin niteliği, öğretmenin rolü, öğrencinin rolü, öğrenme, öğrenme ve öğretim türü, öğretim stratejileri, eğitim ortamları ve değerlendirme değişkenleri açısından incelenmiştir. Çalışmada; veriler betimsel analiz yöntemiyle çözümlenmiş, MOOC video içeriklerinin incelenmesinde nicel araştırma yöntemi kullanılmıştır. Çalışma sonucunda incelenen beş MOOC sitesinde videolarda davranışçı öğrenme kuramının ağırlıklı olduğu görülmüştür. Ayrıca bazı değişkenlerde ise bilişsel öğrenme kuramlarına dayanan içeriklerin olduğu saptanmıştır.

Anahtar Kelimeler: Kitlesel çevrimiçi açık dersler (MOOCs), öğrenme kuramları, uzaktan eğitim, çevrimiçi dersler

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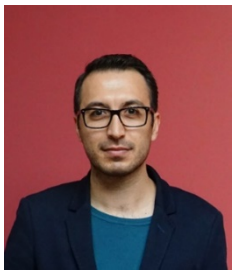

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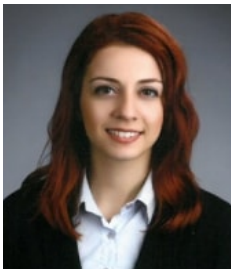

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A COMPARATIVE STUDY OF ONLINE TEACHER-INVOLVED AND PEER INTERACTIVE LEARNING: CHINESE EFL STUDENTS' PERCEPTIONS AND PRACTICES

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Research Article

Abstract

This comparative study aims at exploring Chinese university English as a foreign language (EFL) students' perceptions and practice of two types of interactive learning: the teacher-involved one and the peer one, as well as the factors that may have impacts on their learning. Participants of the study were 32 Chinese EFL students enrolled in a university, being randomly divided into two groups. One group of students participated in teacher-involved interactive learning in an online context; the other group interacted with peers for learning while the teachers were not involved in learning activities. Data collection were administrated via students' online learning documents and semi-structured individual interviews. It was found that students' perceptions and practice were different in two types of interaction. In teacher-involved interactive learning, participants were under the strong impacts of their teachers, and had more stable engagement in learning; while students in peer interactive learning were influenced by a wider range of factors, leading to their less stable participation and production in learning activities. Besides, EFL students were found to be more active in a teacher-involved learning context. Recommendations for future studies are provided on the base of these findings.

Keywords: Online learning, English as a foreign language, interactive learning, teacher-student interaction,peer interaction

1. INTRODUCTION

Interaction is a significant contributor to language acquisition, particularly for language learning that occurs in an autonomous context (Luk & Lin, 2017). In language learning, interaction "is expected to promote negotiation of meaning, and if it does so, this should be beneficial for language acquisition" (Chapelle, 2003, p.56). It is often defined as sustained, two-way communication between learners and learners or, between learners and instructors, with the purpose of task completion or social relationship building (Gilbert & Moore, 1998).

Interactive learning has been widely accepted as an effective approach to develop learners' foreign language knowledge and abilities (Craig, 2006; Hüseyin, 2014).

Interactive learning is originated from Vygotsky's sociocultural theory (Vygotsky, 1978). It lies on the basis of social constructivism, which argues that learners intentionally construct their language knowledge through experience and corresponding reflections with the world (Duffy & Jonassen, 2013). Language knowledge is acquired via meaningful interaction, which occurs through effective response, internal and external negotiation, arguing against points, adding to evolving ideas, and offering alternative perspectives with one another while solving some real tasks (Lave & Wenger, 1991). As scholars have put, social or interpersonal interaction is a key part of interactive learning (Liaw & Huang, 2000).

With the explosion of online technologies and digital devices, new dimensions of interaction have been added to English as a foreign language (EFL) learning. Learning in a technology-supported context, EFL students can participate in interaction in a more self-determined context. They are supported to join in interactive learning both simultaneously and asynchronously, and connect to their teachers and peers without distance and time limits. Technology-supported interactive EFL learning has obtained positive results in different contexts, and has been widely recognized as a preferred approach for language development (Peeters, 2018; Saeed et al., 2018).

Interactive language learning involves two types of interaction, the teacher-student interaction and the peer interaction (Chou, 2003), which are both considered as essential contributors to students' foreign language development (Wang, Woo, & Zhao, 2009). Teacher-involved interaction is common and popular among Asian EFL students, particularly among Chinese students, who rely heavily on teachers in EFL learning (Zheng & Yu, 2018). Teachers are usually playing a dominant role in interactive EFL learning in a Chinese context. While peer interaction contributes to language acquisition as it practices and develops linguistic knowledge and abilities of both sides of involvers in interaction (Long, 2018). Meaningful interaction that occurs among peers can effectively enhance the development of language capacity of all involvers (Vygotsky, 1978).

Empirical studies have been conducted to investigate EFL students' interactive learning (Hsieh, Wu, & Marek, 2017; Yen, Hou, & Chang, 2015). Nevertheless, most previous studies focused on EFL students' engagement in interactive language learning in a traditional teacher-controlled learning context (Tsui & Ng, 2000). There are not many studies on EFL students' possible varied engagement in the two different types of interaction for EFL learning, with less focuses on digging out students' perceptions of the two different interaction. To fill this research gap, Chinese university EFL students' engagement in and perceptions of teacher-involved interactive learning and peer interactive learning are investigated and compared in the present study. The twofold research questions investigated in this study are:

1) What is the possible difference between Chinese university EFL students' engagement in the online teacher-involved interactive learning and the peer interactive one?

2) What factors may result in such differences?

2. LITERATURE

For promoting EFL students' language development, meaningful interactive learning is conducted through effective and instant response, internal and external negotiation, support and argument, adding to new ideas, and offering different perspectives with one another while solving some real tasks emerging in the world (Rostami, Kashanian, & Gholami, 2016; Woo & Reeves, 2007). Through such interaction by using the target language, learners can intentionally construct and internalize foreign language knowledge and abilities (Al-Abdali, 2016), and achieve better goals than learning alone (Nguyen, 2013). A wide range of empirical studies have investigated the effects of interactive learning on promoting EFL students' language abilities from various perspectives: Ciftci and Kocoglu (2012) suggested that interaction helped students focus on EFL learning, and enhanced their confidence in foreign language practice; Hung, Young, and Lin (2015) noticed that interaction encouraged disadvantaged EFL students to achieve better goals in EFL learning; Jahin (2012) confirmed that interaction could be beneficial to EFL students writing skill build-up. Interaction has been widely recognized to contribute to foreign language learners' cognitive and intellectual development, leading to the improvement in their language abilities and knowledge.

In interactive EFL learning, teacher involvement is important to students' language development. The effectiveness of teacher involvement in interactive EFL learning on promoting students' language abilities and knowledge has been widely studied: Bloch (2002) confirmed teachers' contribution to benefiting EFL students' language development in interactive learning; Miao, Badger, and Zhen (2006) figured out the importance of teacher involvement to students' interactive language learning; Yeh and Yang (2011) also confirmed that teacher-involved interaction could effectively improve students' language skills with the support of computers. From the perspective of socio-constructivism, teacher-student interaction is a major type of the social interaction that promotes students' language learning and linguistic knowledge construction (Lave & Wenger, 1991).

As for peer interactive learning, a wide range of benefits for EFL development and knowledge constructions from various aspects have been noticed in previous studies, including improving language skills (Storch, 2005), expanding horizons (Barnard & Campbell, 2005), and enhancing confidence (Parga Herrera, 2011). Besides, interactive learning with peers is described as a learning approach that is "engaging, challenging and interesting" (Wang, 2014, p. 389). Peer interaction employed in EFL students' learning process makes learning interesting and attractive, encouraging students to take more active engagement in learning.

Although many merits of interactive learning are found, not all EFL students engage in it actively. Some of these students are reticent in interactive learning, and escape from interaction with either teachers or peers in their language learning process (Chen & Goh, 2011). Factors that may have impacts on students' willingness of engagement in interactive learning have been spotted and analysed in previous studies.

Language confidence is closely related with students' willingness of participation in interaction for foreign language learning (Clement, Baker, & MacIntyre, 2003). For those students who are in a lack of language confidence, foreign language anxiety is a big challenge that potentially prevents them from engaging in interactive learning actively (MacIntyre & Gardner, 1994). Foreign language anxiety is a common emotional reaction that occasionally occurs during students' foreign language learning process (Horwitz, 2001). Studies have noticed that EFL students from Asia are easily impacted by foreign language anxiety, and may suffer from possible communication apprehension and fear of negative evaluation in their interactive learning process (Chen & Goh, 2011). As Gregersen and Horwitz (2002) have put, language learners who are in a lack of confidence in interactive EFL learning "tend to sit passively in the classroom, withdraw from activities that could increase their language skills, and may even avoid class entirely" (p. 562-563).

Another influential factor of EFL students' engagement in interactive learning is the teacher's position. EFL students often play in "a passive comfort zone" in interactive learning with teachers, particularly in a Chinese context, where teachers usually have a dominant position in teacher-involved learning activities (Xu & Liu, 2009). Students' learning is largely controlled by teachers when learning in this context, allowing less space for students' autonomy in interaction (Littlewood, 2007). It suggests that teachers' dominant position may demotivate EFL students' engagement in interactive learning, and fails to take students' individually different learning interests and needs into consideration.

Peer interdependence is also a concern of students in interactive learning. Previous studies were conducted to investigate the impacts of peer interdependence on EFL students' engagement in interactive learning, though no inclusive conclusions have been made: some believed that positive interdependence can be a contributor to interactive language learning that it strengthens the tension between peers, which encourages them to get active involvement in learning and more exposure to the target language (Johnson & Johnson, 2009; Pishghadam & Ghadiri, 2011); while some argued against the point, and suggested that peer interdependence is less effective on promoting EFL students' engagement in interactive learning, and may discourage them from independent foreign language learning demotivate their future involvement (AbuSeileek, 2012). The effects of peer interdependence on interactive EFL learning still remain a question, and are further examined in this study on the base of empirical research.

Empirical studies have also spotted some other influential factors that might have impacts on EFL students' engagement in interactive learning, such as the effectiveness and efficiency of interaction (Kalanzadeh, Soleimani, & Bakhtiarvand, 2014) and interactive learning topics (Morell, 2007). These findings have provided some insights of interactive EFL learning, as well as students' perceptions of this learning approach, particularly in a newly emerging online context. Contextualized in a Chinese university environment, this study, being illuminated by previous studies, focuses on Chinese EFL students' perceptions of their engagement in interactive learning, and the possible factors that may lead to such perceptions.

3. METHODOLOGY

Participants of this comparative study were 100 non-English majored undergraduate students in a tier-1 university located the southwest part of China. College English was a compulsory course for all participants in the university. Most of these participants had been studying EFL formally for more than eight years in various education institutions in China. They were supposed to be experienced EFL learners, competent English language users, as well as skilful computer users, who were able to use computers and the Internet for online EFL learning. Two of their English teachers were involved in this study as well. Both teachers were experienced in English teaching in a Chinese university context. All participants were native speakers of Chinese mandarin, with English as their foreign language.

A highly recognized online interactive learning platform, which was an achievement produced by a large Australian Research Council (ARC) Linkage project: Image, perceptions and resources: Enhancing Australia's role in China's English language education (2011-2014), was used to serve as the research context for this study. Six modules were selected and employed for participants' online interactive language learning. Each learning module was of similar difficult for Chinese university EFL students. Participants were allowed for two weeks on each module's learning. Students' learning consisted of one complete set of authentic videos and two sets of pedagogical audio materials. A wide range of interactive learning activities and tasks were provided on the platform, supporting EFL students' language learning and skill development.

This was a comparative case study that focused on Chinese university students' online interactive EFL learning. All participants were randomly divided into two groups, with 50 students in each group. The two teacher participants engaged in both groups. Participants were involved in online parallel EFL learning activities. Group A attended the online interactive learning with the involvement of their English teachers. Participants in this group were supposed to engage in interactive EFL learning activities with both their peers and teachers via the Internet. Participants in Group B only interacted with their peers in the EFL learning process in the classroom. Teachers in Group B did not involve in students' learning activities, but only served as learning organizers and observers.

This is a qualitative comparative study by using a variety of methods for gathering data from different sources to validate evidences (Yin, 2013). As a case study, this comparative study does not aim at generalizing the findings, but to present Chinese university EFL students' perceptions and practices of two types of interactive learning that occurred in an online context. The entire comparative study commenced in October 2018 and ended in January 2019, lasting for thirteen weeks. Two methods were employed for data collection in this study: participants' online interaction documents and semi-structured individual interviews. Participants' online learning documents, including the learning logs that were generated in the learning process, and recorded interactive activities of all students, were both collected and analysed for illustrating their interactive learning on the Internet.

Eight student participants, four from Group A and four from Group B, were interviewed individually in a face-to-face way after their online interactive EFL learning. Two in-depth individual interviews with the English teachers were also conducted. Students' learning activities, interpreted from the teachers' perspectives, were investigated in the interview. The difference between students' learning in a teacher-involved context and that in a peer interactive learning one was the focus of the interviews. The individual interviews were guided by an array of questions, which were adopted and modified from previous studies on similar topics (Yang, Badger, & Yu, 2006; Zhao, 2010). The full list of these guiding questions is attached in Appendix I and Appendix II. Each interview lasted for approximately 40 minutes. For encouraging their expression, and for eliminating misunderstanding, participants' native language was used in the individual interviews. Data were recorded and transcribed for analysis. All data that were in Chinese were translated and back translated by professional translators to maintain validity.

4. FINDINGS and DISCUSSIONS

Data from this comparative study suggested that there was no significant difference in students' overall participation in interactive learning activities between Group A and Group B. Considering from all six Learning Modules (LMs), the participation rate of students in Group A was 72%, while that of students in Group B was 70.3%. However, it was noticed from participants' learning logs that the participation rates of Group A were more stable than those of Group B across all six LMs. The participation rates of Group A changed within a very small range from 78% (LM4) to 64% (LM3). While the rates of Group B experienced a more significant change, from the highest point of 94% (LM2) to the lowest one of 34% (LM3). This is presented in Figure 1.

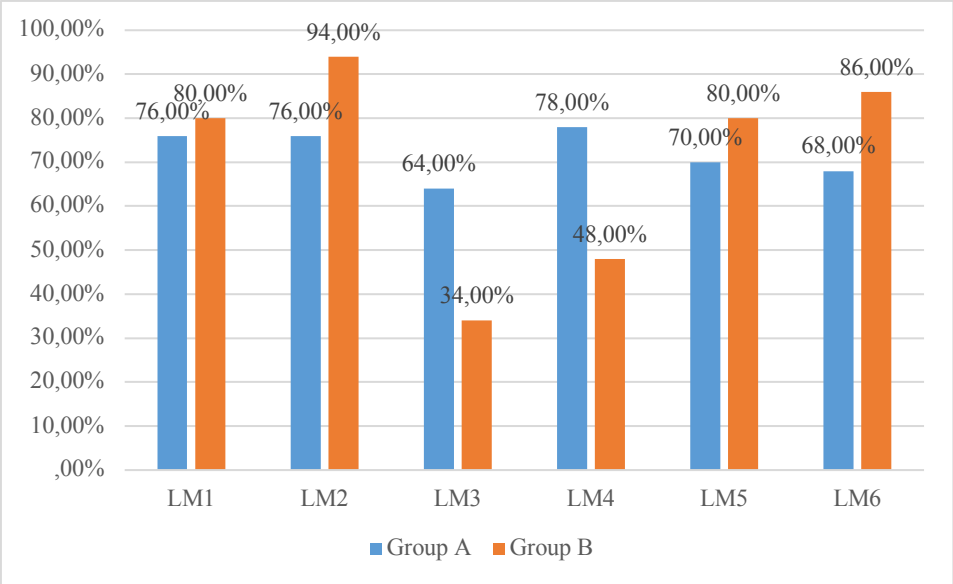

Figure 1. The participation rates of both groups in six LMs.

This study also compared the average production of students in interactive activities from the two groups. As the data showed, the average records of interactive learning activities that were

made by each participant in Group A was 11.53; while the average number of interactive records made in Group B was much less as 7.58. The distributions of student participants' production in the six LMs were not consistent either. Data generated from the platform indicated that EFL students' average production in a teacher-involved interactive learning context did not experience fierce change alongside their stable participation: in average, each student participants in Group A produced stable counts of records of interaction as the highest point of 12.56 in LM6 and the lowest point of 10.66 in LM1. While the average production of participants in Group B was much different. The counts ranged from 10.43 (LM2) to 5.35 (LM6) in the peer interactive context. This is illustrated in Figure 2.

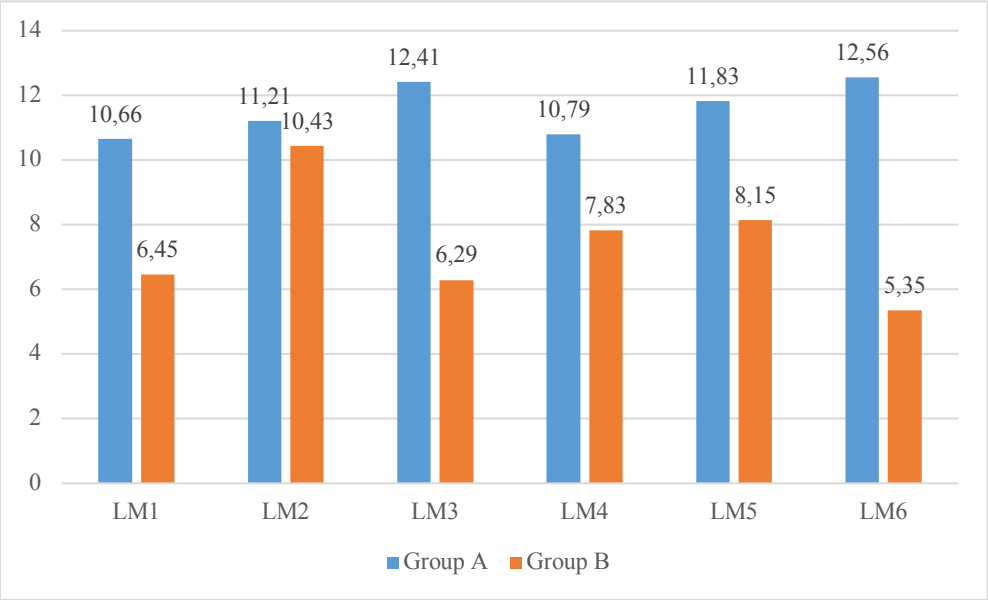

Figure 2. The average production made by each participant in both groups in three LMs.

By examining participants' engagement in all six LMs, this study noticed that EFL students had more stable participation and production in teacher-involved interactive language learning than their classmates in a peer interactive context. It was found from the study that compared with other factors, teachers' high status in language learning in China had more significant influence on students' learning than other factors, which largely led to students' stable engagement in interaction (see Figure 1 & 2).

Teachers usually have a higher status as an authority in language learning, particularly in an Asian context. To date, EFL learning and teaching in Confucian heritage countries, including China, has still applied a teacher-centred approach (Xu & Liu, 2009). EFL students, learning under this circumstance for a long period, were less autonomous in making learning-related decisions when teachers are involved in learning. As students from Group A admitted, they had always engaged in learning "under the command of an authority" (Interviewee 1), whose command was so influential that ordinary students could hardly refuse. For students, teachers' high status in interactive learning was the major factor, which had "excluded impacts from other sources" (Interviewee 2), for students' engagement in learning, even though in an online learning context.

Investigation of the English teachers further revealed the influence of the high status of teachers on EFL learning. When teachers engaged in interactive activities, students relied on them for "almost everything in learning" (Teacher 1). One of the teachers stated that EFL students in interactive learning would "follow my instructions blindly" (Teacher 1). When the teachers requested students' participation, as admitted by the teachers, students "dared not to decline, no matter they liked the learning or not" (Teacher 2). As Zheng and Yu (2018) have put, English teachers in a Chinese context usually enjoy a higher status in teacher-student interaction, making themselves an authority in the process. In this case, teachers' authority made their requests in EFL learning so influential that there was limited room for individual students to voice their thoughts. Therefore, students' participation was stable as students themselves could hardly change their learning under a teacher-involved circumstance.

In a peer interactive context, without teacher involvement, EFL students were found to be more independent and autonomous in interactive learning. The online interactive learning context allowed more spaces for autonomy as students could "progress on my own pace" (Interviewee 5) in a flexible environment. As autonomous language learners, EFL students in a peer interactive context could make decisions on their engagement from various perspectives to serve their different learning purposes, rather than being strictly controlled by their teachers (Littlewood, 2007). As observed in Group B, for teachers were not involved in students' learning process, students engaged in or withdrew from peer interactive learning for meeting their individual learning needs and interests, which "varied from students to students" (Teacher 2). Therefore, being influenced by a wider range of factors, EFL students' participation and production in the peer interactive context had a less stable change from module to module. Further investigation revealed that three key factors might have led to EFL students' different engagement in interactive learning activities, particularly in a peer interactive context: the interactive learning topics, students' language confidence, and peer interdependence.

This study found that the interactive learning topics were a factor that led to students' different engagement in foreign language learning. As previous studies have put (Huang & Lin, 2011; Morell, 2007), EFL students' preferences of a certain learning topic induced their more active engagement in learning activities. In this study, participants in Group B, who "had more autonomy in learning", were "selective" in interactive topics, and displayed stronger willingness to engage in interaction that was "practical", so that they could "put what I learned into the real world" (Interviewee 6). This suggested that language learning that is closely connected with learners' real life, which was considered as "meaningful learning" (Vygotsky, 1978), usually induces their higher participation and stronger learning motivation. From this perspective, autonomous EFL students, particularly those in a peer interactive context, might be impacted and changed their engagement in language learning with the changes of interactive learning topics.

Interviews with teachers also revealed the influence on learning topics on students' engagement in interactive learning. In a peer interactive learning context, students usually chose interactive activities that "actually aroused their learning interests", instead of "considering teachers'

assignment" when teachers were involved in learning (Teacher 1); while for those activities with "boring contents" (Interviewee 8), as teachers observed in this case, students usually escaped from the learning and "refused to communicate with peers" when teachers were not involved (Teacher 1). This finding noticed the strong influence of students' preferences of learning topics on their engagement, which was largely ignored by previous studies (Morell, 2007).

Students' language confidence was also found to be influential on their engagement in peer interactive learning. As Chu (2008) has put, EFL students from Asia are inclined to be impacted by a lack of language confidence and suffer from foreign language anxiety in interactive learning activities. EFL students, who were in "the feeling of tension and apprehension" in interaction, might possibly withdraw from engagement (MacIntyre & Gardner, 1994, p. 284); while their confident peers were more willing to involve in interaction (Gregersen & Horwitz, 2002). In Group B, participants might escape from interactive learning when facing difficult tasks as they were concerned about "my poor English abilities" (Interviewee 7).

Teachers in this comparative study paid intensive attention to EFL students' language confidence, as well as its impacts on students' engagement in interactive learning. As teachers observed in this study, participants "who were confident about their EFL abilities", were more active in peer interaction (Teacher 2). According the two teachers, confident EFL students participated in peer interaction, and "attempted to gain the control" of the learning process; while their less confident peers were usually "more silent" in the interaction (Teacher 1). Previous studies have noticed the effectiveness of language confidence on promoting students' engagement in learning (Horwitz, 2001). However, many of them have ignored that teacher involvement in interaction might "neutralize" the influence of students' different levels of language confidence: students "had to" (Interviewee 2) engage in learning when their teachers asked, no matter how concerned they were. This might lead to EFL students' comparatively stable participation rate in teacher-involved interactive learning.

Besides, it was found that peer interdependence imposed either positive or negative influence on EFL students' engagement in interactive learning, whose effects might be more significant in an autonomous peer-peer context. Positive interdependence could be a contributor to interaction among all involved students in interactive learning (Johnson & Johnson, 2009). The "good interpersonal relationship" (Interviewee 8) between participants encouraged their engagement in learning. Students, who were under the influence of positive interdependence, were found to get active involved in, and enjoyed peer interaction for language development. While negative influence sourcing from peer interdependence could result in oppositional interaction, which might lead to unsatisfying outcomes of learning, and drove students from engaging in interaction for learning (AbuSeileek, 2012). Participants' learning efforts might be obstructed by varies factors, including "ineffective communication" (Interviewee 3), distrust, and "peer competition" (Interviewee 4). Students, thus, might withdraw from interactive language learning due to negative peer interdependence.

It should be noted that the findings on the influence of peer interdependence on interactive EFL learning was in line with literatures (AbuSeileek, 2012; Pishghadam & Ghadiri, 2011). However, this study further noticed that in a teacher-involved interactive learning context, the influence of peer interdependence was limited. Participants in Group A suggested that their peers had little influence on their engagement since "teachers were playing the leading role" (Interviewee 3) in interactive learning. Teachers also noticed that EFL students appeared to pay little attention to their peers' performances in interaction, but "focused heavily on interaction with the teachers" (Teacher 1). It demonstrated the strong and exclusive influence of teachers' high status on Chinese EFL students in a teacher-involved context, which has been discussed before.

In teacher-involved interactive learning, teachers' dominant position helped stabilize student' engagement, and kept the participation and production at an active level. Compared with their peers in a teacher-involved context, EFL students' engagement in peer interactive learning was under the influence of a wider range of factors, including learning topics, language confidence and peer interdependence. Therefore, students' participation and production in peer interactive learning was less stable than that of students in a teacher-involved context.

An interesting finding from the comparative study was that EFL students in teacher-involved interactive learning made more production than their counterparts in a peer interactive learning context (see Figure 2). Considering the similar numbers of involved students in interaction in both groups (see Figure 1), this suggested that EFL students were more active when their teachers were involved in interactive language learning. This seemed to be contradictory to previous thinking on interactive learning. As an array of empirical studies have suggested, peer interactive learning, as a "engaging, challenging and interesting" (Wang, 2014) approach, induced EFL students' higher participation and production as compared to teacher-involved interaction (Barry, King & Burke, 2000). Further investigation of this study spotted two factors that resulted in EFL students' more active engagement in a teacher-involved interactive learning context: students' perceived effectiveness and the interpersonal relationship with peers.

EFL students of this study were found to believe that teacher involvement made the interactive learning more effective and efficient. Students insisted that teacher involvement in interactive learning "ensured its effectiveness" (Interviewee 1). In line with previous studies, a knowledgeable teacher is expected to get involved in interactive EFL learning, as teachers enabled students to see their mistakes and weaknesses and help them overcome the problems (Rahnama, Rad, & Bagheri, 2016). As teachers recalled, when student participants encountered some difficulties in learning, they would sought teachers' assistance as "a prior choice" (Teacher 1). Furthermore, participants were found to be "more active" (Teacher 2) in solving their learning problems through interaction with teachers and peers in a teacher-involved context; while many students in a peer interactive context often "left my questions behind" (Interviewee 6). Teachers thus suggested that students, learning in different contexts, might have different levels of autonomy. Showed in this study, students displayed a higher level of autonomy and learning motivation in a teacher-involved context than their classmates did in

peer interactive context, which is contradictory to previous thinking on language learning (Jiang & Ribeiro, 2017; Nouhi Jadesi, Razmjoo, & Ahmadi, 2016).

Besides, students concerned that their peers might lack essential experience or knowledge to "give valuable feedback" and provided them with "incorrect language knowledge" (Interviewee 2 & 8). EFL students, according to Ching and Hsu (2016), occasionally doubted peers' abilities to provide credible feedback in interactive learning. In this circumstance, students might be reluctant to engage in peer interactive learning, as they did not think they could improve their language abilities through peer interaction. Same findings were discovered in the current study. According to the teachers' observation, student participants in the peer interactive context were less active due to a lack of trust in their peers' abilities. Students found interacting with peers sometimes "meaningless", because such interaction often led to "a dead end" (Interviewee 5) as compared to "helpful instructions" (Interviewee 1) provided by experienced English teachers. For the purpose of obtaining reliable and trustworthy instructions to fulfil their "higher requirements in English learning" (Interviewee 4), student participants were more active in interaction with teachers.

Findings from this study also indicated that interpersonal relationship might prevent Chinese EFL students from actively engaging in peer interactive learning activities. Interpersonal relationship is an important cultural and social concept in a Chinese context (Vanhonacker, 2004). Chinese students always intend to keep good relationships with peers in interaction (Ding et al., 2017). Interacting with peers, as noticed in this study, usually made students "worry about breaking relationship" (Interviewee 6), even in an online context. Students "dared not to" give "critical comments" (Interviewee 4) on peers' presentations in peer interactive learning. This concern of breaking interpersonal relationship with peers largely demotivated students' engagement in learning. Some EFL students "would rather keep silence for not hurting peers' face" (Interviewee 1). Many student-made presentations were observed to receive no comments from others and remained monologic in peer interactive learning activities. For maintaining a group harmony or for reluctance to claim authority among peers, EFL students might escape from peer interaction, avoiding commenting on peers' work directly (Carson & Nelson, 1996). As scholars have indicated, meaningful interactive learning, which is beneficial to EFL development, should be two-way communication with the involvement of both students (Rostami, Kashanian, & Gholami, 2016; Woo & Reeves, 2007). Students, who were passive in peer interactive learning, might not be able to improve their language knowledge and abilities.

These findings on EFL students' engagement in interactive learning are new to the literature, since many previous studies have contextualized in a traditional in-class environment (Ciftci & Kocoglu, 2012; Hung, Young, & Lin, 2015). It should be noted that for many Chinese EFL students, the online interactive learning, as a newly emerging approach for foreign language development, is still following an old teacher-centred mode. Although many have considered the online learning as an autonomous context for students to play a dominant role in their own language learning (Benson, 2000), Chinese students' EFL learning in the context is under the influence of their teachers, as found in this case. It appeared that Chinese university EFL students did not accept the online learning as a totally different approach for English learning,

particularly for autonomous learning, but an expanding platform, where they could get more opportunities to interact with both their teachers and peers for language learning. Considering from this perspective, EFL students' interaction with teachers and peers is both important.

5. CONCLUSION and SUGGESTIONS

This comparative case study investigated Chinese university EFL students' different participation and production in teacher-involved interactive learning and in peer interactive learning. Factors that students perceived to result in such differences were also examined and analysed in the study. Findings indicated that teachers' higher status in China led to students' more stable participation and engagement in teacher-involved interaction as compared to that in peer interaction; while students' engagement in peer interactive EFL learning, which was under the influence of a wider range of factors, including the employed learning topics, students' language confidence and the peer interdependence, experienced changes from module to module. In terms of students' engagement in interactive learning, EFL students were found to be more active in teacher-involved interaction. Two students' perceived factors of teacher-involved interaction, which were the effectiveness of learning activities and the interpersonal relationship with peer students, were spotted to result in their preferences of teacher-involved interactive learning.

These findings highlighted the influence of teachers on Chinese university EFL students' interactive learning, even in an online context. These findings suggested that for these EFL students, online learning was not a different approach for language development, but an expanding platform for more learning opportunities through interaction with both teachers and peer students. It is recommended that teachers should be taken into consideration for EFL learning and teaching, who may play a role in promoting EFL students' language practice and active engagement. The identification of factors that caused EFL students' different participation and production in interactive learning can be also used by researchers and teachers to apply a better approach, which hopefully minimize students' concerns during the process, and help them achieve their learning goals in an online context. EFL students' online interactive learning was yet to be developed to a more self-determined level for better learning outcomes (Luk & Lin, 2017), where students could rely less on their teachers and the traditional teacher-centred learning mode. The current study did not examine to what degree these students' perceived influential factors impacted their participation and production in different types of interactive EFL learning. Further studies may be conducted to investigate the correlation from a quantitative perspective.

Çevrimiçi Öğretmen Katılımı ve Etkileşimli Akran Öğrenmesinin Karşılaştırılması: Çinli Yabancı Dil Öğrencilerinin Algıları ve Deneyimleri

Özet

Bu karşılaştırmalı çalışmanın amacı etkileşimli öğrenmenin iki türü olan çevrimiçi öğretmen katılımı ve akran öğrenme yöntemleri hakkında Çindeki bir üniversitede yer alan yabancı dil öğrencilerinin algılarını ve deneyimlerini araştırmaktır. Rasgele iki gruba ayrılan katılımcılar, Çin'de bir üniversitede öğrenim gören 32 yabancı dil öğrencisinden oluşmaktadır. Bir grup öğretmen katılımlı etkileşimli öğrenme yöntemi ile ders işlerken, diğer grup akran katılımlı etkileşimli öğrenme yöntemi ile ders işlemiştir. Veriler öğrencilerin çevrimiçi dökümanları ve yarı yapılandırılmış görüşme formu aracılığı ile elde edilmiştir. Sonuç olarak iki grup arasında öğrencilerin algıları ve deneyimleri açısından faklılıklar tespit edilmiştir. Öğretmen katılımlı grupta öğrenciler baskın bir şekilde öğretmenin etkisi altındadırlar ve öğrenme etkinliklerine katılımları normal düzeydedir. Akran etkileşimli grupta ise öğrenciler birçok dış faktörden etkilenmişlerdir. Böylece öğrenme etkinliklerine katılımları ve katkıları olumsuz yönde etkilemiştir. Bununla birlikte öğretmen katılımlı gruptaki öğrencilerin öğrenme etkinliklerinde daha aktif rol oynadıkları ortaya çıkmıştır. Araştırma sonunda gelecekteki çalışmalara yönelik önerilere yer verilmiştir.

Anahtar kelimeler: Çevrimiçi öğrenme, yabancı dil olarak İngilizce, etkileşimli öğrenme, öğretmen-öğrenci etkileşimi, akran etkileşimi.

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APPENDIX I

Guide questions for individual interviews with students:

(1) For what purpose did you engage in interactive EFL learning?

(2) What do you think of interaction with teachers in your EFL learning?

(3) What do you think of interaction with peers in your EFL learning?

(4) Did you experience any difficulties or concerns when interacting with teachers in your EFL learning?

(5) Did you experience any difficulties or concerns when interacting with peers in your EFL learning?

(6) If there is any difference between interacting with teachers and peers in your EFL learning?

(7) What factors do you think lead to such differences?

APPENDIX II

Guide questions for individual interviews with teachers:

(1) From your observation, was there any difference between students' participation in teacher-involved interactive learning and that in peer interactive learning?

(2) From your observation, was there any difference between students' production in teacher-involved interactive learning and that in peer interactive learning?

(3) Was there any difference between students' peer interaction in a teacher-involved context and that in a peer-to-peer context?

(4) From your perspective, what factors might result in such differences?

(5) What are the benefits of teacher-student interaction and peer interaction?

(6) Did students encounter any difficulties in their interactive learning with teachers and with peers? What strategies did they use to cope with such challenges?

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USE OF VR HEADSETS IN EDUCATION: A SYSTEMATIC REVIEW STUDY

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Review Article

Abstract

In recent years, it can be said that the use of new virtual reality related technologies increased swiftly. Especially virtual reality headsets have become an important device in virtual reality and augmented reality applications. As a consequence of these developments, researchers started to investigate the use of virtual reality headsets in many fields. In this respect, the purpose of this study is to perform a systematic review with content analysis on the articles about the use of VR headsets in education in the Scopus database between 2014 and 2019. A total of 49 related article were found and examined to determine the major topics, research methods/models, most cited papers, data collection tools, participants and variables in these articles. Because no systematic review study has been conducted on this topic in literature, the study is considered to be important. As a result, it was found that the number of studies about the use of virtual reality headsets in education tends to increase by year. In addition, it was seen that quantitative methods as research methods, undergraduate students as participants, and pretest-posttests as data collection tools were the most favored ones. Besides, it was found that usability and experience were the most preferred dependent variables.

Keywords: Content analysis, research trends, systematic review, virtual reality headset

1. INTRODUCTION

Both hardware and software technologies of graphic processing have been developed substantially with parallels with technological developments in all areas. With these developments it is now possible to create virtual reality (VR) environments which are very similar to the real life. These environments include simulations, hologram, virtual life, virtual reality, augmented reality (AR) applications. The use of real-like simulations, which can be dangerous in real life, prevents material and moral damages. For example, piloting educations are performed with pilot simulations for a long period of time, and then trainees try to fly a real plane. These applications provide real-like virtual environments that the users feel it almost like a real life. This is called immersion which can be defined as an artificial environment that is convincingly enough for users to engage with it like it is real.

According to Bayraktar and Kaleli (2007), VR is a simulation model which is created dynamically in computerized environment in which users feel some kind of created reality and interact with objects and each other. VR does not have to be like real life. It can be different

with its own rules. Most of the VR applications are games. But it is also possible to see educational VR applications in use. According to ResearchandMarkets' 2018 report, VR game market will reach a value of US$ 32.8 Billion by 2023, which it already reached a value of US$ 8.2 Billion in 2017 (ResearchandMarkets, 2018). With this forecast, it can be said that VR will be an important technology in future.

One of the most important examples of VR is the Second Life application. Second Life was first released in 2003 by Linden Lab and had over a million active users in 2013. Second Life which is free to use is not a game. It is a virtual world with its own rules. There are virtual replications of many real things. For instance, some of the universities open and manage virtual campuses in Second Life. Educational activities like conferences, courses, etc. are organized. Users use 3d avatars, which are mostly 3d human like illustrations or cartoon characters, to interact with the virtual world. In second life, users can interact with each other, attend social events, build structures, buy, sell, do businesses. In Second Life, Linden Dollar is used in the virtual economy. Linden Dollar can be exchanged with real currencies in LindeX system. Consequentially, it can be said that Second Life is a huge virtual world with its own physical rules different from real world. In this virtual world it is possible to find a lot of interesting contents from education to art, from science to music.

Another topic about VR is VR headsets which support immersion at a very high level. In another market research, it is forecasted that VR headset market will reach a value of US$ 37 in 2020 which it already reached a value of US$ 7 Billion in 2016 (Statista.com, 2018). In the market, Playstation VR, Oculus Rift and HTC Vive are the most favored VR headsets. Figure 1 shows the market share.

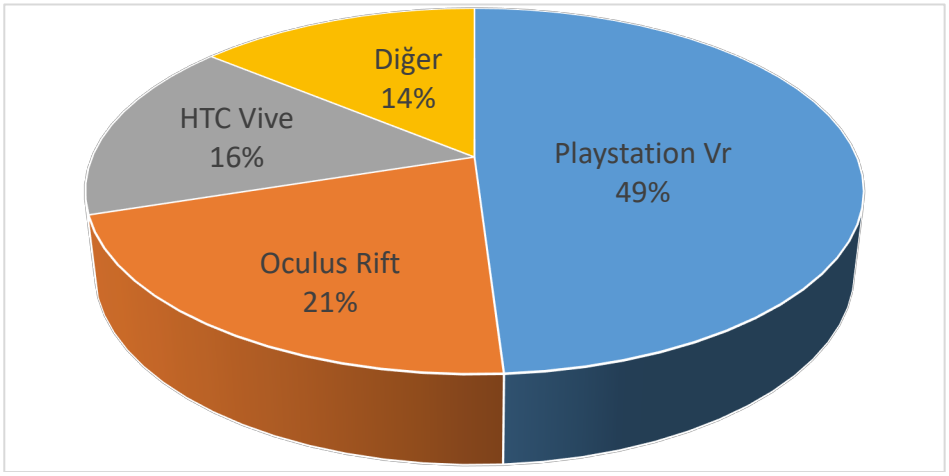

Figure 1. Market Share of VR Headsets
Source: https://www.digitaltrends.com/virtual-reality/playstationvr-outsells-htc-vive-oculus-rift/

In the figure, it can be seen that Playstation VR, which can be used only with Playstation Game Console, is the leader in the market. Oculus Rift, HTC Vive VR headsets also have a decent market share. Thus, it can be said that VR headsets' fist intended use is the VR games.

Oculus VR company started to developed Oculus VR in 2012 and released some prototypes in the process which can be bought by developers and enthusiasts. Facebook bought the Oculus VR company in 2014. Then the first Oculus Rifts were released to the end users in 2016. The Oculus Rift headset has an OLED panel for each eye which has resolution of 1080x1200, a

refresh rate of 90 Hz and 110 degree field of view (Desai, Desai, Ajmera, & Mehta, 2014). Figure 2 shows a picture of Oculus Rift Headset with two controllers and two trackers.

Figure 2. Oculus Rift Headset

Trackers can measure the coordinates of the headset and the controllers with millimetric accuracy in 3D space. Users interact with two controllers in the VR environment like holding an object or shooting a gun in a game. Of course, the primary development purpose of Oculus Rift is to be used in more realistic VR games. However, there are also lots of different uses of VR headsets like social virtual worlds, education, 3D films. Linden Lab and other virtual word firms like Facebook Spaces have plans for VR headsets integration. With some of them, it is already possible to use VR headsets.

HTC Vive is another important VR headset. Its development started in 2014 and released to end users in 2016. Like Oculus Rift, it has resolution of 1080x1200, a refresh rate of 90 Hz and 110-degree field of view for each eye. Oculus Rift and HTC Vive are desktop-based VR headsets which require a powerful computer with a powerful GPU.

Sony started to develop Playstation VR in 2014 and released to end users in 2016. Playstation VR designed to be used with Playstation Game Console. But it can be possible to use it with computers with an extra hardware. Playstation VR has an OLED panel for each eye which has resolution of 1920x1080, a refresh rate of 1200 Hz and 100-degree field of view.

It can be said that this is rather a new technology in its early stages. However, VR headsets can provide immersive 3D experiences to users who can play VR games or use other VR applications with high motivation and reality. Furthermore, educators and researchers in different fields are interested with VR headsets for educational and academic uses from psychology to anatomy.

A search in the database of Scopus using ((ABS ("VR" OR "Virtual Reality" OR "augmented reality") AND ABS (headsets OR headset OR glasses) AND ABS (education OR training OR learn OR learning OR train OR instruction OR instruct OR teaching OR teach)) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re")) revealed the results presented in Figure 3 regarding the number of related studies by year. This search tried to find articles and reviews about VR headset use in education. Besides, because the first prototypes were released in 2014, studies performed in 2014 and later were included in the search.

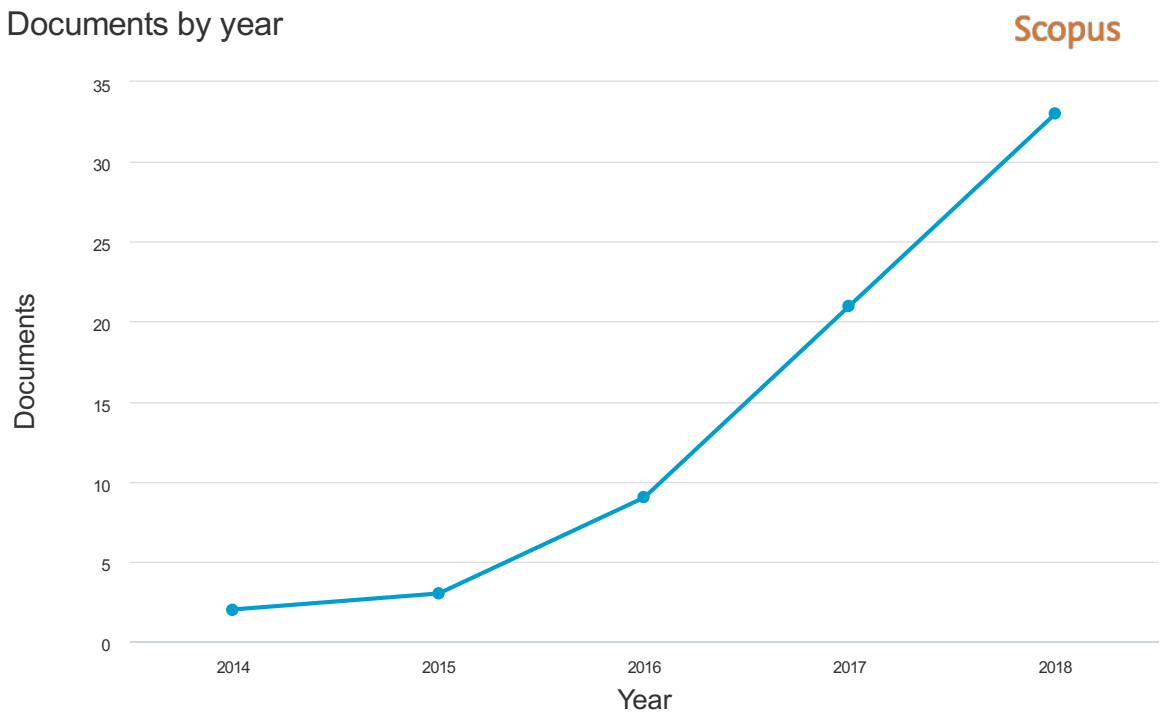

Figure 3. Number of Papers in Scopus Database

As can be seen in Figure 3, there has been a gradual increase in the number of studies conducted on VR headsets in education. Especially after 2016, these headsets became widespread, and their use in education increased gradually. When the related literature is examined, it can be seen that there is a need for an up-to-date study reviewing the related literature. By mapping known literature, this review will hopefully provide a timely insight into the current state of research on the use of VR headsets in education. In this respect, the purpose of the present study was to examine the studies on the use of VR headsets in education in Scopus database in terms of certain variables.

2. RELATED LITERATURE

In literature, there is not any systematic review article about the use of VR headsets in education. However, VR and AR are two concepts which are of great significance for VR headsets. Accordingly, in related literature, the review studies on VR and AR in education were examined. Therefore, the review studies conducted on these concepts are thought to be important to help understand the concepts.

Wang et al. (2018) examined 66 articles in the review study of the use of virtual reality in construction engineering education and training. The fist article was conducted in 1997 and after 2011, there were an important increase in the number of articles published. Naturally most of the studies used Desktop-based VR technology. 3D Game-Based VR and Augmented Reality are the other technologies used in fewer studies. Most of the studies are performed in the fields of Construction Engineering Education and then Construction Safety Training.

Another systematic literature review study was performed about VR and AR in tourism research (Yung & Khoo-Lattimore, 2017). They reached 46 papers as a result of the search in the databases of Scopus, EBSCO, Elsevier, Proquest, and Emerald. it was revealed that most of the studies were about virtual worlds, followed by virtual environments and augmented reality. They also found that the most studied topics were marketing and education, that the most

frequent research methods included conceptual papers (13 papers) and case studies (10 papers), that 73% of the papers used experimental design and only 11 of them had a theoretical background.

A systematic review study on AR use in education was performed with 68 articles published in SSCI journals (Akçayır & Akçayır, 2017). It was reported that the first articles were published in 2007 and especially after 2010 number of articles were increased significantly. They found that the participants in the studies were k-12 students (51%), undergraduate students (29%), adults (7%) and teachers (3%). The also stated that in the articles the most preferred delivery technology was mobile devices. They interpreted that mobile devices are ideal platforms for AR applications because of their cameras and mobility. In addition, regarding the depended variables, the researchers reported that 32 of them were about learners' achievement, 10 about motivation, 8 about enjoyment, 6 about engagement and 6 about attitude. They also found that among some articles it was reported that AR use in education could be some negative aspects like difficult to use for students, more time required, and low sensitivity in triggering recognition.

In a systematic review study about AR trends, 32 articles in 5 top journals about educational technology with high impact factors were examined (Bacca, Baldiris, Fabregat, Graf, & Kinshuk, 2014). They found that most of the studies were on science learning (13), humanities and arts (7), engineering (5) and social sciences. They also found that the participants in the studies were undergraduate students (11), primary school students (6), lower secondary school students (6) and upper secondary school students (4). Also, according to the researchers, aims of the studies were about explaining the topic (14), augment information (13), educational game (6) and lab experiment (6). They found that 14 of them examined the variable of learning gains, 10 of them examined the variable of motivation, 6 of them examined the variable of collaboration and 5 of them examined the variable of interaction. Also, according to the researchers, studies reported that AR had positive influence on learning (17), motivation (9), engagement (5), attitude (4) and enjoyment (4). They also found that the sample sizes of the studies were between 20 and 200 in 25 studies, and 30 or less in 6 studies. They found that the most frequent research methods were mixed method (15), qualitative (11) and quantitative (6), respectively. They found that questionnaires (24), semi-structured interviews (9), survey (6) and observation (3) were used as data collection tools.

28 empirical research articles from 2010 to 2017 were reviewed in the review study about the use of AR technology to support science, technology, engineering and mathematics (STEM) learning (Ibáñez & Delgado-Kloos, 2018). Articles were retrieved from ACM Digital Library, ERIC, IEEExplore, ISI Web of Science, ScienceDirect, Scopus, and Springer databases. In these studies, observation (14 studies) was the most used instructional learning technique, inquiry (10) was the second. Research methods used in these studies are quantitative (13), qualitative (5) and mixed-method (10). Academic achievement (18) was the primary focus for most of the studies. Also, affective outcomes like motivation (7), enjoyment (5), Attitude (5) and engagement (5) were investigated

In an another review study regarding using AR in education, 38 articles published in between 2016 and 2017 years and indexed in Web of Science and SSCI, SCI-EXPANDED, A&HCI, CPCI-S, CPCI-SSH, and ESCI databases, were examined (Rabia M. Yilmaz, 2018). It was revealed that of all the studies, participants were primary school students (11), undergraduate students (10), high school students (5), secondary school students (4) and kindergarten students (4). The researcher reported that science education is the leading topic in the studies. She also

found that 23 of them examined the variable of academic achievement, 9 of them examined the variable of motivation and 6 of them examined the variable of attitude.

3. METHODOLOGY

In this study, a systematic review study was performed with a content analysis on papers, published in academic peer reviewed journals indexed in the database of Scopus, regarding the concept of the use of VR headsets in education. In content analysis, researchers try to interpret the data by coding and determining themes through the systematic classification process (Hsieh & Shannon, 2005, p.1278). With content analysis it is possible to summarize a large volume of literature. Researches in the field can use the results of this type of study to direct their future studies (Petticrew & Roberts, 2006).

Articles were searched with the following criteria in mind: being published in a peer reviewed journal, being written in English and being published in between 2014 and 2019. To find the appropriate articles, a search was performed in the Scopus database. Scopus is the largest database including peer-reviewed articles in academic journals from all over the world (Buyukkol Kose, Cetin, & Yunkul, 2018). To reach all the articles about the use of VR headsets in education, various concepts such as VR, AR, headsets, glasses, education, etc. were used in the search statement. The purpose of the search was to find all of the articles about the use of VR headsets in education. The search statement used was as follows:

> (ABS ("VR" OR "Virtual Reality" OR "augmented reality") AND ABS (headsets OR headset OR glasses) AND ABS (education OR training OR learn OR learning OR train OR instruction OR instruct OR teaching OR teach)) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014))

72 articles were found in the search. 69 of them were accessed as full-text, and because three articles were not reached as full-text articles, they were excluded from the study. Finally, a total of 69 articles were downloaded and examined. Consequently, 20 articles were excluded because it was decided that they were not about the use of VR headsets in education. Figure 4 summarizes the overall research process.

Figure 4. The Overall Research Flow

As a result, content analysis was conducted with 49 full-text articles which were examined thoroughly. Percentages and frequencies were given about the participants, data collection tools, variables/research interests and research methods/designs in the articles. The findings were interpreted and compared with the results of other similar studies in literature.

3.1. Reliability

An excel table was prepared with the codes and the information of articles downloaded. The articles were analyzed one by one by the researcher and two colleagues separately. And all of them prepared their own excel tables with analyzed information. Three tables were checked about the differences which were resolved with a consensus by the researcher and two colleagues. The content analysis was finalized with the consensus about all the findings.

4. FINDINGS and DISCUSSIONS

In this section, the participants, data collection tools, variables/research interests and research methods/designs in the articles were reported. Distribution of the articles was given in Figure 5 by year.

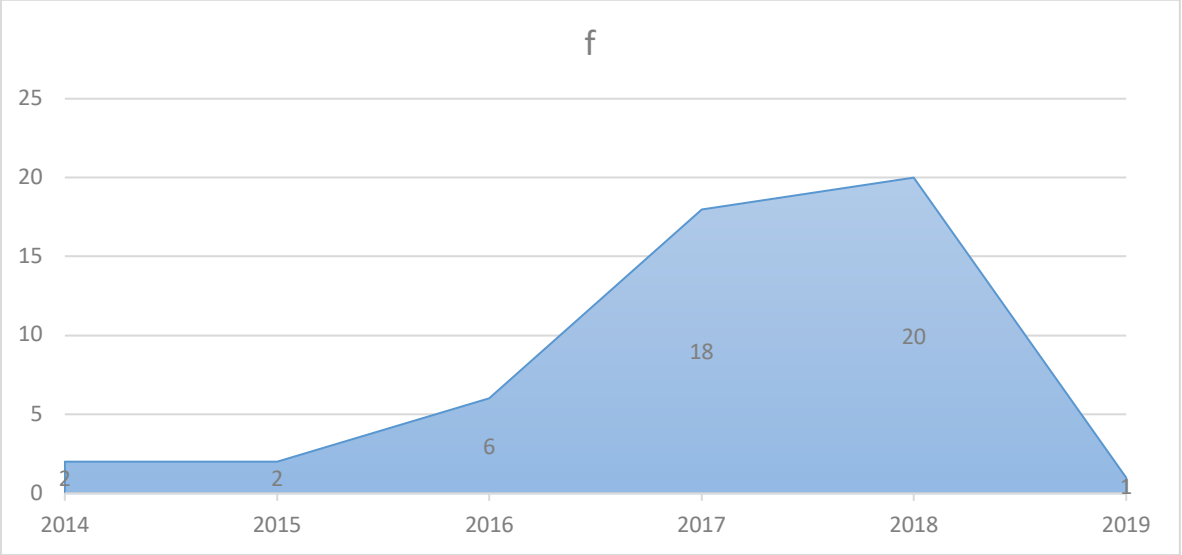

Figure 5. Number of Publications in the Use of VR Headsets in Education Topic

According to the figure above, 2018 was the most productive year. Especially after 2016, the number of published articles increased gradually. The search was performed in January of 2019, so it can be said that number of articles in 2019 did not represent the real value. Besides it could be stated that there has been a gradual increase in the number of studies.

4.1. Most Cited 5 Studies

The studies included in the study were also examined with respect to the number of times that they have been cited, and the most cited 5 studies are presented in Table 1.

Table 1. List of The Most Cited Publications

Publication Name	Authors	Journal	Cited by	Research Methods	Main Focus of The Study
Virtual reality and augmented reality in plastic surgery: A review	(Kim, Kim, & Kim, 2017)	Archives of Plastic Surgery	15	Systematic review	The article describes a systematic literature review conducted to investigate the state-of- the-art VR/AR technology relevant to plastic surgery.
Computer-assisted culture learning in an online augmented reality environment based on free-hand gesture interaction	(Yang & Liao, 2014)	IEEE Transactions on Learning Technologies	14	Experimental	The aim of the study is to incorporate the latest AR and CV algorithms into a Virtual English Classroom, called VECAR, to promote immersive and interactive language learning.
Augmented reality assisted surgery: A urologic training tool	(Dickey et al., 2016)	Asian Journal of Andrology	13	Survey	In the study, the authors developed an application for use on Google Glass® optical head-mounted display to train urology residents in how to place an inflatable penile prosthesis.
Head-mounted display-based intuitive virtual reality training system for the mining industry	(Zhang, 2017)	International Journal of Mining Science and Technology	11	Survey	By employing a VR headset, a smartphone and a leap motion device, an HMD based intuitive type VR training system prototype for drilling in underground mines has been developed
Using Technology to Meet the Challenges of Medical Education	(Guze, 2015)	Transactions of the American Clinical and Climatological Association	10	Literature review	This article presents how the use of technologies can provide the infrastructure and basis for addressing many of the challenges in providing medical education for the future.

In Table 1, it can be seen that the most cited article was a systematic literature review performed with the Conceptual/Descriptive methods. The second most cited article was an experimental study with pretest and posttest groups. It can be seen that more than half of the articles in the list were performed with quantitative methods. Of all the most cited five studies, three of them were about medical education. It can be said that researchers in medical education field, showed great interest in the use of VR headsets in education.

4.2. Keyword Analysis

The major topics covered in the articles were determined with keyword analysis. The result of the analysis was given in Figure 6.

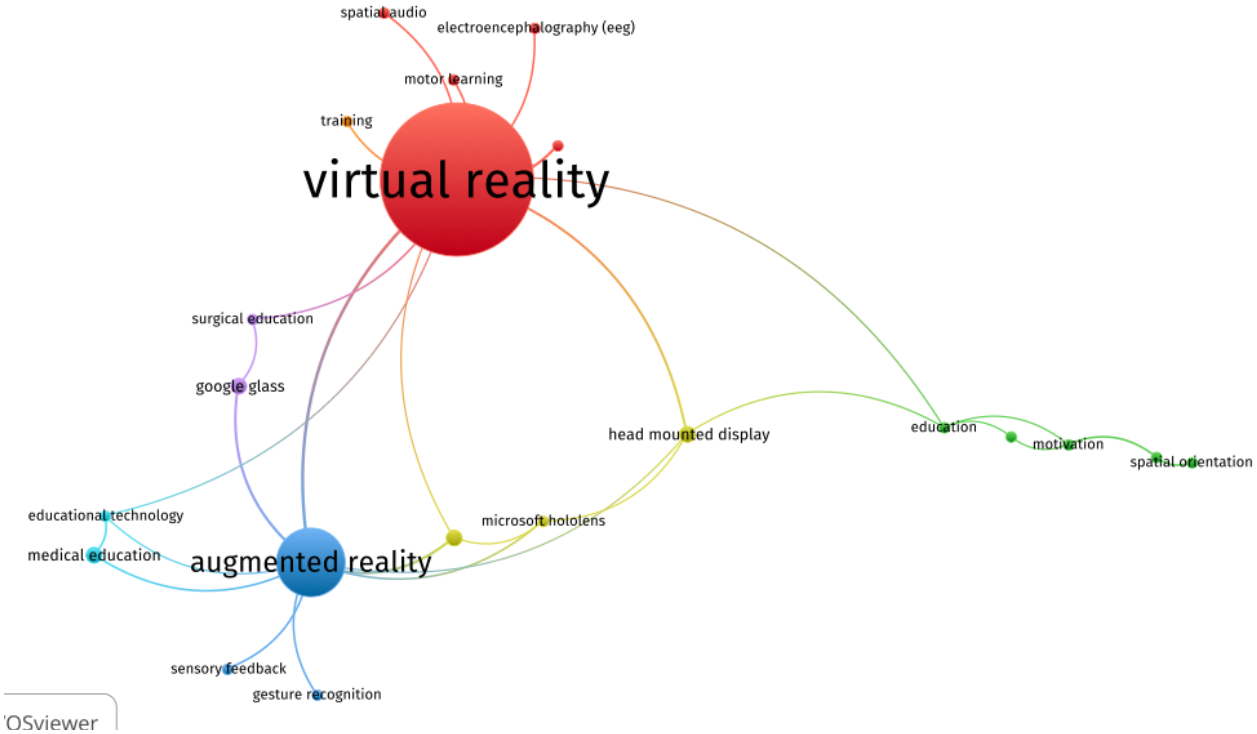

Figure 6. Major Topics Covered

Radius of the circles represents frequency. In addition, colors and lines represent groups and relationships. According to the frequencies of the keywords, it was seen that concepts such as VR and AR were prominent. In review studies conducted on VR and AR in education in related literature, it was seen that they did not include any keyword analysis. However, in general, it can be stated that keywords such as head mounted display, Microsoft hololens, google glass, medical education, educational technology, surgical education, education, training, motivation, etc. are popular keywords in this field. Different from that, it can be said that the VR and AR are the most preferred keywords in the articles about the use of VR headsets in education.

4.3 Participants

The frequencies and percentages about the types of participants in the articles were given in Table 2.

Table 2. Participants

Participants	Frequency	Percentage	Sample Size
Undergraduate students	20	50	10-769
Adults	16	40	1-115
K-12 Students	2	5	25-437
Academician	2	5	11-30

*In a study, more than one target group type could be used

According to the data presented in Table 2, it was seen that undergraduate students (N=20) and adult learners (N=16), were the most preferred participant types which constituted 90% of all the participants.

Undergraduate students and adult learners were used more. It was thought that it is not surprising that undergraduate students can be easy to access for academicians, and because

quite number of studies were about medical education, their samples were mostly adult patients. The finding about undergraduate students being favored most in the studies is parallel to the findings of other review studies (Akçayır & Akçayır, 2017; Bacca et al., 2014; Rabia M. Yilmaz, 2018).

4.4. Data Collection Tools

Frequencies and percentages of the types of data collection tools utilized in the studies were presented in Table 3.

Table 3. Data Collection Tools

Data Collection Tools	Frequency	Percentage
Pretest-posttest	14	26,5
Questionnaire	13	24,6
Interview	11	20,7
Scale	9	17,0
Focus Group	3	5,6
Observation	3	5,6

*In a study more than one data collection tools could be utilized.

According to Table 3, pretest-posttest (26,5 %), questionnaire (24,6 %), interview (20,7 %) and scale (17,0 %) were the most favored data collection tools used in these studies. Academic achievement tests, questionnaire and interview were the most common data collection tools. This result was similar with the results of other research (Bacca et al., 2014; Ibáñez & Delgado-Kloos, 2018).

4.5. Variables/Research Interests

Table 4 presents the frequencies and percentages of dependent variables used in the studies. While some studies used more than one dependent variable, in some studies especially qualitative and review studies, no dependent variable was used.

Table 4. Variables / Research Interests

Dependent Variables	f	%
Usability	11	24,4
Experience	9	20,0
Academic-performance	8	17,8
Perception	5	11,1
Skill development	5	11,1
Engagement	3	6,8
Self-efficacy	2	4,4
Others	2	4,4

*In a study more than one dependent variable could be used.

According to Table 4, usability (24,4 %) was the most favored dependent variable used in 11 studies. This variable was followed by “experience” (20,0 %) in 9 studies, “academic performance” (17,8 %) in 8 studies and perception (14,2 %) in 5 studies. Usability, experience and academic performance constituted more than half of all the variables. Other studied in related literature mostly focused on academic performance, motivation, engagement and attitude variables. Different from that, in this study, usability and experience were the most interested variables. It can be stated that it is not surprising that researchers tend to investigate

the usability and experience dimensions of newly released technological tools for educational purposes.

4.6. Research Method and Design

Table 5 presents frequencies and percentages of Research Methods/Designs used in the studies.

Table 5. Frequencies of Research Methods/Designs

Method	f	%	Model/Design	f	%CUM	%TOTAL
Quantative	25	52	Survey	8	32	16
			Experimental	17	68	35
			Causal Comparative	0	0	0
			Correlational	0	0	0
			Meta-analysis	0	0	0
Qualitative	7	14	Case Study	7	100	14
			Content Analysis	0	0	0
			Etnography	0	0	0
			Descriptive	0	0	0
			Phenomenology	0	0	0
			Grounded Theory	0	0	0
			Meta-synthesis	0	0	0
			Historical	0	0	0
			Heuristic	0	0	0
Mixed	6	12	xplanatory sequenti	3	50	6
			Embedded	1	17	2
			Convergent Parallel	1	17	2
			xploratory Sequenti	0	0	0
			Multiphase	1	17	2
			Transformative	0	0	0
Conceptual/ Descriptive /Other	11	22	Opinion Paper	0	0	0
			Literature Review	3	27	6
			Report	0	0	0
			Reflection Paper	5	45	10
			Comparative	0	0	0
			Technical Paper	1	9	2
			Position Paper	0	0	0
			Field Notes	0	0	0
			Systematic Review	2	18	4

Table 5 shows that quantitative methods (52%) were the most preferred research methods, while researchers used only experimental (n=17) and survey (n=8) studies as model/design in quantitative methods. 22% of studies preferred conceptual/descriptive (%22) research paradigm, and reflection paper (n=5) was the most preferred model/design. Popularity of research methods and models can be similar or different in other review studies. In some review studies, mixed methods (Bacca et al., 2014; Gurhan Durak, Çankaya, Yünkül, & Misirli, 2018) were used more, and in some other studies, the Conceptual/Descriptive methods (Gürhan Durak & Çankaya, 2018b, 2018a; Yung & Khoo-Lattimore, 2017) were favored more. Similar to the present study's findings, in a review studies carried out by Ibáñez and Delgado-Kloos (2018), quantitative methods were used more.

5. CONCLUSION and SUGGESTIONS

This study examined 49 articles to determine the trends in studies about the use of VR headsets in education. The findings revealed that from 2014 to 2019, there was a positive trend in the number of studies by year. According to the findings it was found that quantitative methods were used in more than half of the studies. 22% of the studies preferred conceptual/descriptive methods. It can be said that this is an expected finding, because experimental methods are preferred frequently in the studies which are supposed to have practical implementations. When the most cited five studies were examined, it was seen that 2 studies were performed with survey research model found under the category of Quantitative methods. On the other hand, the most cited study preferred systematic review model/design. It can be said that systematic review studies are supposed to be cited more than other type of studies, because they summarize a lot of studies and guide other researchers in the field. This study is also a systematic review study which reveals the current state of research on the use of VR headsets in education. As a result of the keyword analysis, it was found that VR and AR were the most preferred ones. It can be said that this is an expected result that VR headsets are used in VR and AR environments. In addition, it was found that undergraduate students and adult learners were the most preferred participant types in studies, and pretest posttest and questionnaire were the most preferred data collection tools.

It was appeared that there was not any systematic review study about the use of VR headsets in education topic. Therefore, the present study is going to be the first. According to the findings, the following suggestions were made for researchers who intent to work on this field:

- Less used dependent variables can be focused in the future studies for maximum variety to investigate different aspects of the topic.
- According to the findings it was found that the least favored research method was the mixed method, which have advantages of both quantitative and qualitative methods. Therefore new mixed method studies can be performed with multiple data collection tools to gather more in-depth data.
- This study was based on the articles accessed with a search query in Scopus database. A new content analysis can be performed with a search in different databases.

Eğitimde Sanal Gerçeklik Gözlüklerinin Kullanımı: Sistematik Derleme Çalışması

Özet

Son yıllarda sanal gerçeklik teknolojilerinin kullanımının önemli derecede arttığı görülmektedir. Özellikle sanal gerçeklik gözlüklerinin, sanal gerçeklik ve arttırılmış gerçeklik uygulamaları için önemli cihazlar haline geldiği söylenebilir. Bu gelişmelerin bir sonucu olarak araştırmacılar, sanal gerçeklik gözlüklerini çok farklı alanlarda araştırmaya başlamışlardır. Bu bağlamda bu araştırmanın amacı, Scopus veritabanında yer alan, 2014 ile 2019 yılları arasında yayınlanan ve sanal gerçeklik gözlüklerinin eğitimde kullanımı ile ilgili olan makalelerin içerik analizini gerçekleştirmektir. Toplam 49 makaleye ulaşılmış ve bu makaleler; konu alanları, araştırma yöntemleri, en çok atıf alan makaleler, veri toplama araçları, katılımcılar ve değişkenler bakımından incelenmiştir. Bu konu ile ilgili alanyazında daha önce yapılan bir sistematik derleme çalışması olmadığı için, bu çalışmanın önemli olduğu düşünülmektedir. Sonuç olarak eğitimde sanal gerçeklik gözlüklerinin kullanımı ile ilgili çalışmaların yıllara göre bir artış gösterdiği görülmektedir. Ayrıca, araştırma yöntemi olarak nicel yöntemlerin, katılımcı olarak lisans öğrencilerinin ve veri toplama aracı olarak ise öntest-sontest ölme aracının makalelerde en çok tercih edildiği ortaya çıkmıştır. Bununla birlikte kullanılabilirlik ve deneyim, en çok araştırılan bağımlı değişkenler olmuşlardır.

Anahtar kelimeler: araştırma eğilimleri, içerik analizi, sanal gerçeklik gözlükleri, sistematik derleme

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