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Editorial Board

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From the Editors

Dear JETOL readers,

We proudly introduce the first issue of JETOL: Journal of Educational Technology and Online Learning. JETOL is a refereed, open access e-journal that disseminates original research, theory, and best practice on educational technology and online learning. We hope that JETOL will be a premier source for those who seek and pursuit knowledge.

The first article, written by Xiaoli YU and Veysel Altunel, is entitled "Second Language Vocabulary Learning From Context Clues: A Review of Research in the Past Decade and Implementation in Digital Environment". The article presents a review of the literature on vocabulary learning and suggests that context clues are not an effective vocabulary learning strategy.

The second article, A review of Current Studies of Mobile Learning, authored by Abdulvahap Sönmez, Lütfiye Göçmez, Derya Uygun, and Murat Ataizi. The article provides an up-to-date review of research on mobile learning and concludes that mobile learning is an effective model when skillfully implemented to educational processes.

The third article, Examining to Interface of Lego Mindstorms EV3 Robot Programming, written by İsmail Kunduracıoğlu. This article addresses an up-to-date topic, that is robot programming. In this regard, the article introduces Lego Mindstorms EV3 robot, examines the programming interface and provides information on how to use it.

The fourth article, Suggestions for Implementation of Flipped Classroom Model, authored by Mehmet Urfa. The article explores flipped classroom, which is widely used approach for blended learning. The article discusses strengths and limitations of the flipped classroom and explains how to implement it.

The fifth article, VoScreeen: Online Language Learning Environment, written by Ufuk Taylan. The final article introduces VoScreen which based on its own learning method and approach developed through meticulous research on the native language learning process and environmental language acquisition.

Dr. Gürhan Durak

Dr. Aras Bozkurt

Yours respectfully

Editors in Chief

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Second Language Vocabulary Learning From Context Clues: A Review of Research in the Past Decade and Implementation in Digital Environment

Xiaoli YU [a], Veysel ALTUNEL[b]

[a] *University of Central Florida, Orlando, USA.* ***(Corresponding author)***
[b] *Army NCO Vocational College, National Defense University, Turkey.*

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Review Article

Abstract

This article reviews empirical studies from the past decade in learning second language (L2) vocabulary from context clues. Previous studies conclude that guessing unknown words from context clues is not an effective vocabulary learning strategy. Rather, it should be employed as a complementary approach. In alignment with this standpoint, review of the most recent empirical studies reveals that merely relying on context clues does not lead to the most effective L2 vocabulary learning. The learning result highly correlates with the learners' language proficiency. However, recent studies did not downplay the role of incidental vocabulary learning from reading. More researchers explore the appropriate types of vocabulary for inferring from the contexts and the corresponding pedagogical strategies. This article concludes with pedagogical implications of teaching L2 vocabulary in digital environment.

Keywords: Context clues, vocabulary learning, reading, second language acquisition, digital learning

1. INTRODUCTION

Using context clues to infer unknown words during reading is a commonly used strategy for both first language (L1) and second language (L2) readers. Different from L1 readers, L2 learners may find this a rather difficult task due to limited reading comprehension capacity in the target language. Indeed, compared to consulting a dictionary, guessing word meanings from context clues can be less disruptive for extensive reading. Yet, whether this reading strategy can lead to effective vocabulary learning and successful comprehension of the text, research suggests various findings.

Based on numerous empirical studies, Folse (2004) concludes that guessing word meanings from context clues does not necessarily contribute to effective vocabulary learning. Instead, it requires L2 learners to master a large size of vocabulary in order to guess accurately. Folse suggests that using context clues can be employed as a compensatory strategy for reading comprehension rather than a main vocabulary learning method. Thirteen years after Folse's book was first published, the field of vocabulary teaching and researching has reached to a new altitude. Meanwhile, using context clues for L2 vocabulary learning continues to be a

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controversial practice. To achieve the most effective L2 learning and teaching approaches, it is crucial to have a thorough analysis and understanding of the effects of using context clues in L2 vocabulary learning. . Hence, this review article synthesizes empirical studies that were conducted in the past decade to obtain state-of-the-art implications for L2 vocabulary learning and pedagogical practice.

2. CAN L2 LEARNERS SUCCESFULLY LEARN NEW VOCABULARY FROM CONTEXT CLUES?

In this section, five empirical studies are analyzed to address whether L2 learners can successfully guess and learn vocabulary from context clues. The summary of the studies can be found in Table 1.

Kondo-Brown (2006) investigated how English L1 learners of advanced Japanese (N = 42) infer unknown kanji (Chinese character) words in context. Decontextualized and contextualized kanji tests were conducted to the same group of participants. The results suggested that the participants failed to guess most unknown target words, with a successful rate of 16.7%. In addition, the participants did not perform equally at guessing the meanings of the unknown kanji: participants with higher proficiency in reading can use context clues significantly better than the less proficient ones (p < .001). The author notes that inferencing unknown words in context are most likely to occur only when L2 learners are equipped with adequate vocabulary knowledge.

Hamada's (2014) study compared L2 learners' lexical inferencing abilities of using context clues and morphological information (N = 107). The participants were asked to answer 20 multiple-choice questions to infer the meanings of the pseudo compounds in both morphology reliable and unreliable conditions. The results indicated that the participants' lexical inference abilities were influenced by their proficiency levels in morphology unreliable condition. The high-intermediate and advanced groups were better at choosing the answer option based on contextual information than the beginning group did (p < .001), whereas the beginning group chose the answer option based on morphological information more often than contextual information. This finding aligns with Kondo-Brown's (2006) study, noting that merely providing context clues do not lead to successful lexical inference and L2 learners' proficiency level largely influence their abilities of using context clues in guessing the word meanings.

Another study examined the participants' explicit and tacit lexical knowledge that developed incidentally for novel L2 words through reading a long continuous text (Elgort & Warren 2014). Different from the above two studies, Elgort and Warren argue that text length itself can be a factor influences L2 learners' lexical inferencing and reading comprehension; meanwhile, both explicit and tacit measures should be included to gain a full picture of the participants' learning of the target unknown words in context. The study used a long connected text in a non-experimental environment. Forty-eight advanced and high-

intermediate adult L2 learners were recruited and asked to read a 40,000 words expository text within 10 days. Participants were required to read the text with 48 target pesudowords without using a dictionary. After completing each chapter, their explicit and tacit knowledge of the target words as well as comprehension of the text were tested by using different methods. The result shows that 10 out of 48 pesudowords were learned by the participants, which suggested a modest vocabulary gain. Again, the results of this study demonstrated the influence of proficiency level on learning of unknown words in context as in previous studies. Moreover, the target words' positions in the context, degree of keyness, and concreteness also have significant impacts on learners' vocabulary learning. Elgort and Warren suggest that inferring word meanings from context only is not enough for reliable vocabulary learning and contextual word learning is a rather slow and incremental process.

Nevertheless, there are studies indicate the potential positive effect of guessing vocabulary from context clues. Ebrahimain and Nabifar (2015) compared the effect of three vocabulary learning strategies, including word-part, word-card, and context-clue methods. The experiment included 60 Iranian high school students for a 4-week period. The three experimental groups were instructed by a same teacher to learn 40 new vocabulary, each group received one treatment of vocabulary learning method. After the instructional phase, immediate and delayed posttests were conducted to examine the effects of different treatments. The results indicated that context-clue strategy yielded higher test scores than the other two strategies in both immediate and delayed posttests ($p < .05$). Yet, the results of this study are not unquestionable. First, no control group was involved. Thus, whether the posttest scores of each group were results from the treatments needs to be discussed. Second, the difficulty level of the learning task was quite unchallengeable for high school students. Therefore, one may argue that the students should be able to learn 40 new vocabulary over 4 weeks no matter what kind of learning strategy is used.

Overall, most well-designed research did not yield considerable effectiveness and efficiency of using context clues to learn new L2 vocabulary. It is highly based on the learner's existing L2 proficiency and vocabulary size. However, this does not mean that teachers and learners should downplay the importance of incidental learning through reading. Pigada and Schmitt's (2006) case study reveals that if 95% of the vocabulary was known to the participants, substantial learning of the target words occurred during the extensive reading treatment. Hence, when the learner masters sufficient vocabulary, vocabulary learning from context clues is more likely to take place.

Table 1. Summary of empirical studies.

Study/Year/ Journal	Research Questions	Participants	Methodology	Results
Kondo-Brown, (2006), *Language Learning*	How do English L1 learners of Japanese in advanced level infer unknown kanji words in context?	42 English L1 learners of advanced Japanese at a US university	16 target kanji; decontextualized & contextualized kanji test; two reading comprehension tests to check proficiency levels.	- Most participants cannot successfully guess the meanings (16.7%); - More proficient participants can use context clues better; - Adequate vocabulary knowledge is needed.
Hamada, (2014), *The Modern Language Journal*	How does the choice of information (morphology or contextual) in lexical inference differ depending upon the learners' L2 proficiency and the reliability of the morphological information?	107 IEP participants in beginning, intermediate, high intermediate, and advanced levels.	20 multiple-choice items; two sentence conditions: morphology reliable & unreliable	- Proficiency level influences lexical inferring under morphology unreliable condition; - The beginning group based more on morphological information; the advanced groups could use more contextual information
Elgort & Warren, (2014), *Language Learning*	How does lexical knowledge develop incidentally for novel L2 words through reading a long connected text?	48 advanced and high-intermediate adult L2 learners from diverse L2 backgrounds	40,000 words text read within 10 days, 48 pseudowords, 95% lexical coverage by the first 7000 most frequent English words, comprehension & word retrieval questions, asking word meanings/synonyms	- Modest vocabulary gain: 10/48; - More advanced participants were more likely to learn the meanings of target items after fewer encounters; - Other influential factors: spacing of repetition; keyness, concreteness, gender, etc.
Ebrahimain & Nabifar, (2015), *The Journal of Applied Linguistics*	Are there any significant differences among the word-part, word-card, and context-clue strategy groups in learning vocabulary?	60 EFL Iranian high schoolers	3 experimental groups 40 target vocabulary; 4 weeks training; post tests of choosing synonyms	- Context-clue group yielded higher immediate and delayed posttest scores than the other two groups.
Pigada & Schmitt, (2006), *Reading in a Foreign Language*	Does extensive reading lead to increased word knowledge in terms of spelling, meaning, and grammatical behavior of words?	One 27-year-old intermediate level French learner	133 target words; 95% of the words are known to the participants; Sensitive measurement procedure, multiple sensitive tests of word knowledge	- Substantial learning of the target words occurred during the extensive reading treatment; - 65% of the target words was enhanced in some way; - Spelling was strongly enhanced.

3. WHAT TYPES OF VOCABULARY ARE EASIER TO BE INFERRED THROUGH CONTEXT CLUES?

If guessing unknown words from context clues is still an option for classroom teachers, it is necessary for them to know the preferable types of the target vocabulary. In this section, I examine three empirical studies to investigate the types of vocabulary that are easier to be guessed from context clues. Table 2 presents the key points of the three studies.

Van Assche, Duyck, and Brysbaert (2013) explored cognate facilitation effect of verbs and the influence of verb tenses in inferring unknown words in sentence contexts. The first experiment examined the participants' L2 lexical processing abilities (N = 46). The participants were asked to make quick decisions on judging whether a presented word in minimal context was a real English word or not. The presented words belonged to cognate or non-cognates categories. The results suggested that the 1) cognates were recognized more quickly and accurately than non-cognates; 2) present tense verbs were recognized more quickly than past tense verbs. The second experiment of the research tracked eye movements, indicating that present tense verbs were read more quickly than past tense verbs in terms of skipping rates and gaze duration. Overall, the results of this research favor the advantageous role of cognates and verbs in present tense in L2 lexical recognizing or inferring.

Mestres-Missé, Münte, and Rodriguez-Fornells (2014) addressed the concreteness effect of the target vocabulary in learning words from verbal contextual information. One experiment focused on the learning of an abstract new word from contextual information. Eighteen undergraduate Spanish-Catalan bilingual students were involved. Three sentence conditions were created for embedding the 36 target abstract words into sentence contexts. The conditions included meaningful condition, non-meaningful condition, and real-world condition. Participants were asked to write down the meaning of the new word or a synonym. In alignment with a previous study (Mestres-Missé et al. 2007), the result reveal that abstract words were generally processed slower than concrete words. Another experiment in the research also reached the conclusion that concrete word meanings were discovered and learned faster than abstract word meanings even when matched on context availability. Elgort and Warren's (2014) study supported the findings, revealing that chances of robust learning were higher for more concrete lexical items.

Golonka, et al. (2015) discussed the role of lexical context for native English speakers in learning Arabic L2 vocabulary. Overall, the study suggested learning vocabulary from reading for comprehension was less effective than learning from vocabulary-focused decontextualized or semi-contextualized tasks. The researchers note the necessity of scaffolding activities and word-focused activities in facilitating L2 reading and word learning. Due to the features of Arabic language, the meanings of the roots helped the participants guess the meanings of unfamiliar words. Thus, for specific languages, it is beneficial to consider the morphological forms or word parts to promote word guessing.

Table 2: Key points if the three studies.

Study	Major findings
Van Assche, et al., (2013), *Studies in Second Language Acquisition*.	1) Cognates were recognized more quickly and accurately than non-cognates; 2) Present tense verbs were recognized and read more quickly than past tense verbs in terms of skipping rates and gaze duration.
Mestres-Missé, et al, (2014), *Second Language Research*; Mestres-Missé et al, (2007), *Cerebral Cortex*; Elgort & Warren, (2014), *Language Learning*.	1) Concrete word meanings were discovered and learned faster than abstract word meanings even when matched on context availability; 2) Chances of robust learning were higher for more concrete lexical items.
Golonka, et al., (2015), The *Modern Language Journal*.	1) For Arabic as a L2, the meaning of the roots help the participants have a better chance to guess the meaning of unfamiliar words; 2) Morphological forms or word parts are beneficial for promoting word inferencing

4. PEDAGOGICAL IMPLICATIONS

Despite limited strengths that context clues have in vocabulary learning, incidental learning and using contexts to facilitate reading should not be neglected as extended reading can lead to larger gains accumulatively. In this section, pedagogical suggestions from three studies are provided for teaching L2 learners to use context clues for vocabulary learning and reading. Summary of the studies can be found in Table 3.

Karbalaei, Amoli, and Tavakoli (2012) suggested that using context clues can be an effective word learning strategy if students were explicitly taught on how to use them. The strategies the researchers noted include locating appositives, searching for explicit definitions or explanations within the text, and using prior knowledge while reading etc. However, educators should keep in mind that the effective use of these strategies requires one's solid mastery of the neighboring vocabulary and context knowledge.

Regarding presenting unknown words occurred in contextual reading, Ko (2012) investigated the effect of L1 and L2 glosses. The participants (N = 90) read texts under no-gloss and glossed conditions, later were tested with target vocabulary from the texts. The immediate vocabulary test indicated a significant difference between no-gloss and glossed conditions. L2 gloss group achieved the highest scores, with L1 gloss and no-glossed groups following. Overall, compared to risky and misleading results of guessing unknown words from context clues, glossing has a positive effect on L2 vocabulary inferencing and learning. Moreover, the participants expressed their preference for L2 glosses over L1 glosses.

Lastly, Webb (2008) advised the importance of the quality of the contexts in gaining knowledge of word meanings. In his study, participants in experimental and control groups were asked to read target words with more and less context information that was known to them, later their knowledge of the target words was tested in terms of recall of form, recognition of form, and recall of meaning. The findings supported the effect of contextual richness in acquisition of meaning. The results also showed that the meanings can be learned relatively quickly with repeated occurring of the unknown words.

Table 3: Pedagogical suggestions of the three studies

Study	Pedagogical suggestions
Karbalaei, et al., (2012), *European Online Journal of Natural and Social Sciences*.	1) explicit teaching and scaffolding of using context clues; 2) locating appositive; searching for explicit definitions or explanations within the text, using prior knowledge while reading; 3) a strong mastery of neighboring vocabulary is needed.
Ko, (2012), *TESOL Quarterly*.	1) Glossing can have a positive effect on L2 vocabulary inferencing and learning. 2) the participants expressed their preference for L2 glosses over L1 glosses.
Webb, (2008), *Reading in a Foreign Language*.	1) positive effect of contextual richness in acquisition of meaning; 2) if the unknown words repeatedly appear in informative contexts, the meanings can be learned relatively quickly; 3) all the running words in the contextual sentences need to be known.

5. USING CONTEXT CLUES IN DIGITAL ENVIRONMENT

Even though context clues have not been researched as the most effective approach to enlarge individual's L2 vocabulary size, classroom teachers, educators, and L2 learner themselves may still use context clues as a common way of referring meanings of unknown words. In particular, with the increasing number of digital texts available, it is necessary for readers, either L1 or L2, to take better advantage of context clues in understanding the texts efficiently. However, with limited vocabulary size of the target language, L2 learners need more assistance in using context clues. In this section, an example of using context clues in digital environment is provided.

Data-Driven Learning (DDL) can be used in digital environment as an effective approach to assist L2 vocabulary learning through context clues. This approach aims to help learners to engage in target language through accessing larger linguistic data (Johns, 1991). Corpus-based approaches are commonly used in DDL for L2 learning. A corpus is a large collection of naturally-occurred written or spoken language. Hence, corpus-based approaches help learners analyze how the target vocabulary is used in an authentic setting and further their understanding of the specific vocabulary.

Recent development in technology enables teachers and students to use corpora to analyze authentic language data through concordance lines, namely occurrences where the target vocabulary were used in previous contexts. Using concordance lines can be considered as an application of DDL. For example, Corpus of Contemporary American English (COCA) has been used by many researchers, teachers, and learners. The current size of COCA is more than 560 million words which include texts from different registers, such as spoken, fiction, and academic texts (Davies, 2008-). By searching the unknown words, users are able to access all the previous occasions where the particular word has been used and read through the concordance lines. Without looking up the dictionary, users might be able to figure out the meaning of the unknown word in various examples and extend their reading opportunities. Table 4 illustrates an example of concordance lines of the word *contemporary*.

Table 4: Concordance lines of the word "contemporary" on COCA

1	2011	ACAD	and has been perpetuated by the art market. The first sales of modern and contemporary Southeast Asian paintings at Sotheby's in Singapore prominently featured the works of European artists
2	2007	ACAD	"? # Even if that is so, we claim and proudly mobilize as contemporary " others ", finding ourselves at a point in time, little more than
3	1990	MAG	the garbage can. # That said, it must also be added that our contemporary interest in ornamental grasses has almost nothing to do with early-20th-century horticultural traditions or the
4	2003	ACAD	now awaits the pilgrim and tourist alike (Figure 6). A new, contemporary, Trinidadian-style temple has been built on a platform behind the original one, and
5	2011	MAG	walls-a step removed from the traditional estancia-hint at Vik's cool design sense. The contemporary art is first-class. Three windmills lend power; in summer, geotherrnal energy cools
6	2011	NEWS	of survey show that rates a subtitle: " Exploring the Influence of Sustainability on Contemporary Art. " Practically speaking, that means a lot of pieces assembled from found
7	2015	NEWS	Congress Ave. $3-$5 (free on Tuesdays). 512-453-5312, **25;6019;TOOLONG. The Contemporary Austin, Laguna Gloria. " Looking Up, " sculpture by Tom Friedman.
8	1993	NEWS	a spectacular room for residents to cook, dine, relax and entertain. The contemporary kitchen/family room includes two work areas for more than one cook, conversation and dining
9	1997	NEWS	a film. # The television series " Mr. Bean, " which features a contemporary sort of silent-movie clown who blunders through every day escapades with mime and slapstick, had
10	2015	MAG	the part of the church as a whole are two elements obstructing the renewal of contemporary religious life, for every baptized Catholic has a role to play in the task

Empirical studies have also validated the effectiveness of using concordance lines in facilitating L2 vocabulary learning. For instance, Cobb (1999) and Horst, Cobb, and Nicolae (2005) suggest that by inferencing word meanings through concordance lines, L2 learners are able to expose to more natural and informative language contexts. Meeting the unknown words in contexts fosters deep processing of the words and promotes vocabulary acquisition. In addition, Yoon and Hirvela (2004)'s study investigated the issue from L2 learners' perspective, which did not reveal difficulties in implementing the corpus-based approach of using concordance lines.

6. CONCLUSION

Overall, this review aims to provide L2 educators with empirical results from relatively recent studies in teaching L2 vocabulary. Most research in the past decade agrees with the research findings summarized in Folse (2004), merely relying on context clues is not an effective vocabulary learning strategy, especially for L2 learners with low proficiency. However, it is worth noting that the studies did not downplay the role of incidental vocabulary learning from reading. The researchers recognize the potential benefits of extensive reading for vocabulary learning and the advantages of using contextual information for independent L2 learning. Hence, more precise while comprehensive research offers evidences on what types of

vocabulary are more appropriate and likely to be learned from context clues. Lastly, corpus-based approaches, in particular concordance lines, are recommended as an effective strategy of using context clues in digital environment.

İçerik İpuçlarını Kullanarak İkinci Dilde Kelime Öğrenme: Son On Yılda Yapılan Çalışmaların İncelenmesi ve Dijital Ortamdaki Uygulamaları

Özet

Bu çalışmanın amacı, içerik ipuçlarını kullanarak ikinci dil (L2) kelime öğrenme konusunda son on yıl içerisinde yapılmış deneysel çalışmaları incelemektir. Alanyazında yapılmış çalışmalar incelendiğinde, içerik ipuçlarını kullanarak bilinmeyen kelimeleri tahmin etmenin etkili bir kelime öğrenme yöntemi olmadığı görülmüştür. Bu yöntemin tek başına kullanılmasının yerine tamamlayıcı bir yaklaşım olarak kullanılması gerektiği söylenebilir. İncelenen çalışmalarda yabancı dilde kelime öğrenmenin sadece içerik ipuçlarına dayandırılmasının da etkili bir yöntem olmadığı sonucuna varılmıştır. Öğrencilerin dil yeterliliği ile öğrenme faaliyetlerinin gerçekleşmesi arasındaki ilişkinin yüksek olduğu alanyazında ifade edilmiştir. Bununla birlikte yapılan araştırmalarda okuma etkinliklerinin tesadüfi kelime öğrenmede etkili olduğu söylenebilir. Her geçen gün bu alanda çalışan araştırmacılar da içerikleri kullanarak anlam çıkarmak için uygun kelime tiplerini ve etkili öğrenme yöntemlerini keşfetmeye çalışmaktadırlar. Ayrıca bu çalışmada dijital ortamlarda yabancı dil kelime öğretiminin pedagojik etkilerine de yer verilmiştir.

Anahtar Kelimeler: İçerik ipuçları, kelime öğrenme, okuma etkinliği, ikinci dil öğrenimi, dijital öğrenme

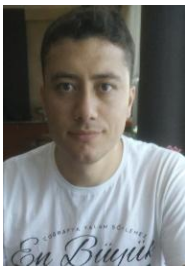
About the Author(s)

Xiaoli YU (Corresponding Author)

Xiaoli YU had her bachelor's degree in Business English from Shandong University of Finance and Economics in 2012, and master's degree in TESOL from the University of Kansas in 2014. She is currently a PhD candidate and GTA in TESOL at the University of Central Florida. Her research interests are L2 vocabulary, grammar and writing instruction, corpus linguistics, and language and social obstacles confronted by non-native English learners.

Mailing Address: UCF College of Graduate Studies, Millican Hall 230, Orlando FL, USA. 32816
GSM : +1 785 727 54 62
e-mail : xiaoli.yu@ucf.edu

Veysel ALTUNEL



Veysel ALTUNEL had his bachelor's degree in ELT from Marmara University in 2012, and master's degree in TESOL from the University of Kansas in 2015. He is currently a lecturer at the National Defense University, Army NCO Vocational College. His research interests are individual differences in language education, corpus linguistics, and educational technologies in language education.

Mailing Address: Kara Astsubay Meslek Yüksek Okulu, Altıeylül, Balıkesir, Turkey 10100
GSM : +90 507 628 43 78
e-mail : valtunel@msu.edu.tr

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A Review of Current Studies of Mobile Learning

Abdulvahap SÖNMEZ [a], Lütfiye GÖÇMEZ [b], Derya UYGUN [c], Murat ATAİZİ [d]

[a] *Anadolu University, Eskisehir, Turkey.*
[b] *Aksaray University, Aksaray, Turkey.*
[c] *Anadolu University, Eskisehir, Turkey.* ***(Corresponding author)***
[d] *Anadolu University, Eskisehir, Turkey.*

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Abstract

Technological developments influence educational systems. It can be conducted that educational environments are not limited to schools. With the use of technology in educational systems, ways of having to access information have changed, and such concepts as mobile learning have emerged. In recent years, mobile learning (m-learning) has been an important component of distance education. For that reason, the aim of this study is to summarize research findings in the literature by employing literature review. On this basis, research published between 2013 and 2017 was included to the content of this study. Throughout the research, 11 research articles published during that time in 8 prominent peer-reviewed research journals were analyzed. Purposes, methodologies, and outcomes of these researches were explained. Therefore, the study is considered to be important since it tried to reveal the related research trends in mobile learning.

Keywords: Mobile learning, distance education, technology, mobile technology

1. INTRODUCTION

The possibility of global access to mobile devices, especially mobile phones, increases the interest in m-learning day by day. Although mobile learning is a new mean of teaching and learning for the education world, it has a bright and promising future because mobile learning can engage the learner into the educational process by supplying him/ her with alternative environments. Mobile learning is attractive because it enables the learner to get the information, communicate and socialize while on the go. Moreover, it can improve the higher order of thinking skills by enabling personalized learning by motivating the distance learner. When the interest of people into the mobile technology is considered, mobile learning, with a blended design of technology, pedagogy and context can change the way we teach and learn. It can lead to a paradigm shift that will be for the benefit of all people.

1.1. What is Mobile Learning (Technology)?

From 2000 years, worldwide mobile devices were adopted by large masses of people because better, faster and cheap models of such devices can be reached by everyone easily. According to the statics explained by Gartner (July, 2014), tablets' sales quantity was 206.8 million in 2013, in 2014 it was 256.3 million and cell phones' sales quantity was 1.807.0 billion in 2013,

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in 2014 it was 1.862.8 billion. According to the search done by "Portio research" (2013) in 2012, 1.2 million people use mobile applications all over the World and in 2017 it is assumed that number will be 4.4 million. When these statistics are considered, it seems that mobile devices and applications are used by people from all over the world.

Mobile learning is a kind of learning which offers to learners independent of the time and place. Many definitions have been made of what m-learning is, and those definitions have lost their validity in a short time due to the rapid development of mobile technologies. For that reason, we handled only commonly used and contemporary definitions in the field literature. According to Hidayat and Utomo (2014) m- learning can be defined as a service that gives general information electronically to the learner. They can provide the educational content which helps the achievement of knowledge without question the location and time. Mobile learning is a part of e-learning activities (Viberg, 2015). The distinguishing aspect is that m-learning applies for portable small technology tools while e-learning uses all learning and teaching technologies, including mobile learning ones. M-learning applications generally reach to the learner via e-learning means.

Mobile technology is a new emerging technology in education. It is the peak of advanced technology for all parts of society (poor-rich; educated-uneducated) for its easy availability. Besides its accessibility, it is the personalization of a technological tool that can assist its owner free from border of time, place and communities. Although there is not an agreement among scholars on the definition of mobile learning because of the mobility of both technology and learning itself, Yamamoto (2013) manages to meet all aspects of mobile learning in her mobile learning definition. For her, mobile learning is not just a means of supplying the learners with barrier-free accessibility of required information, but it is also a way of enlightenment that can be presented ''without breaking apart from life''.

Besides the ambiguity of definition, there is also a disagreement on the technologies that can be categorized as mobile learning technology. According to UNESCO (2013), the tools that enables mobile learning and teaching are 'mobile phones, tablet computers, e-readers, portable audio players and handheld gaming consoles' Netbooks and laptops can also be added to this category.

Mobile learning technologies have some common aspects as portability, small size, interactivity and ubiquity. Mentioned features make these devices more essential. Regardless of the model of the learning technology, it is widely used all around the world, which sheds lights on its tendency for becoming a convenient means of learning/ teaching in distance education. When distance learners are taken into consideration, the suitability of this technology becomes more apparent in that distance learners are formal ones whose settings are their homes, office, a jungle or top of a mountain. Whatever the setting is, portable internet-connected devices enable them to learn, teach, share, communicate and socialize at any time the way they want.

Mobile learning technologies have a promising future if they are properly integrated into the current system or if the system undergoes some critical changes to be suitable for the implementation of this technology. The integration of m-learning requires delicate pedagogical design for the benefit of the learners. To make good use of the applications provided by m-learning tools, the user should plan his/ her learning activities beforehand. A learner with a high degree of motivation can easily plan and organize learning activities. But the main requirement for the benefit of both the learner and the applications is the ability to use the mobile learning technology properly and effectively. A learner with required skills and certain strategies can benefit from the applications voluminously and share content and resources in a self-determined manner (Brown & Mbati, 2015). We think that if the distance learner has self-control and self-regulation abilities with required skills, he/ she will get the most out of the mobile learning technologies.

1.2. The Benefits of Mobile Learning

Mobile learning devices are portable and have the affordance to connect to the internet whenever needed. A travelling distance learner can benefit from that technology without interrupting his / her journey (on the condition that internet is provided). Thus, being able to connect to the internet is crucial while using one of mobile learning devises. McQuiggan (2015) indicates that having a connection to internet requires internet capability that allows the user to access new content on demand. In addition to the users-on-the go, disadvantaged and disabled learners can also take advantage from this technology to overcome the distance, not being able to attend to the normal courses and poverty because learners at far distance don't manage to come and attend regular courses provided by the state for them. Furthermore, disabled learner can learn and socialize via their mobile devices without taking the risk of being injured or troubled by getting out of their safety places.

While using m-learning technology, a user plans, organize, carries out and evaluates his learning because he/ she is the controller of mobile-based activities. Thus, the learner is not a passive person who takes the required information but he/ she is the person who uses cognitive and mega-cognitive abilities to achieve the task. So, the user improves his/ her higher-ordered thinking skills (McQuiggan, 2015).

The user doesn't have to be constrained to certain environment to learn effectively. Learning in informal settings can contribute by allowing the individual to make use of personal learning styles and opportunities presented by the environment, including social and technical factors (Viberg, 2015). The learner can choose any setting real or virtual that fosters his/ her learning and thinking abilities from the lake side to a virtual space craft. The personalization of leaning environment can motivate the student and increase the outcomes of distance education through m-learning tools.

1.3. The Challenges of Mobile Learning

The first challenge of mobile learning technology and other technologies is technological determinism. Although technology is an important factor in the changing society, it is not a sole determinant (Kirkwood, 2014). Social changes stem from many evolving factors just one of which is technology. Placing technology and thus mobile learning technology in the centre lessons the expected outcomes for the users' benefit. Thus, m-learning technology is just a tool that may create more meaningful means to teach and learn at distance.

Designing of m-learning applications is another task that needs professional skills and strategies. The way either converting the context into the technology or changing the current system (not innovation) for the usefulness of the m-learning tools determines the success of the learners. The blending of pedagogy, technology and context in accordance with the individuals' aspects needs a special care and designing. According to Viberg (2015), a system designer is to observe ten vital rules during designing mobile learning,: Cost, system usability, choice of technology, roles, equipment management, support for teachers, administration, collaboration services or application and security issue.

After creating a prospering design, another problem appears: Technology literacy of teachers and students. ''Requirement of fluency in the authoring tools for mobile learning systems'' has the utmost importance (Setirek &Tanrikulu, 2015). However successful the applications are, if the instructors and students aren't excelled in using this technology, achievement of the system is not even a matter of discussion. Digital literacy, unfortunately, is a challenge both for teachers and learners (Brown & Mbati, 2015).

The prejudice and attitudes against technology is another problem. Although people are tend to be willing to learn new information, as to technology and its acceptance, they may reject or be suspicious of it just because either they don't know how to use it or they think they don't need it (Turan and Haşit, 2014, p.1). It is essential to identify prejudice and attitude and convince the learner about the practicality and benefit of the new technology (Joo & Kim, 2016, p.615).

1.4. Review Studies Related to m-learning

Three previous literature reviews studied research trends in mobile learning. Wu, Wu, Chen, Kao, Lin and Huang (2012) reviewed 164 studies from 2003 to 2010 on mobile learning. They reviewed the literature systematically and provided an extensive analysis. They found that the most studies of mobile learning focus on effectiveness, then mobile learning system design. They explained that researchers used mostly surveys and experiments as research methods. Moreover, mobile phones and personal digital assistants are the most widely used devices for m-learning but they stated that these may be displaced by emerging technologies. Besides, it is reported that the most highly-cited articles are about mobile learning system design and system effectiveness.

Hwang and Tsai (2011) reviewed journals in the Social Science Citation Index (SSCI) database from 2001 to 2010, selecting 154 articles on mobile learning. They searched the number of articles published, research sample groups, research learning domains, and country of origin. They found that higher education students were the most frequent research populations, then elementary school students and high school students. They indicated that the most studies weren't about any particular learning domain. Studies on m-learning investigated the motivation, perceptions and attitudes of students toward m- learning. Lastly, they stated that articles were written by the authors mostly from USA, UK, and Taiwan.

The study done by Hung and Zhang (2011) investigated the trends of articles in m-learning using text mining techniques. 119 articles from the SSCI database were analyzed. In this study, it is reported that m-learning articles enhanced from 8 in 2003 to 36 in 2008 and Taiwan is the most productive country about m-learning.
The previous studies submit crucial issues related to m-learning. However, m-learning is liable to continuous change with developments in technology. There is a need for contemporary studies about mobile learning due to the rapid development of mobile technologies. Moreover, those studies didn't mention research purposes and methods of search articles. This study provides literature review method in examining trends in mobile learning studies.

1.5. The Statement of the Research Problem

Mobile learning is one of the important topics of educational applications for new technologies and there have been many studies on it. Although m-learning is a very crucial topic for the educational environments, there isn't update review studies on m-learning. There is a need to investigate the m-learning field to be able to understand and interpret the new issues. The purpose of the study is to summarize the research findings in the literature by employing content analysis. Consequently, the studies published between 2013 and 2017 were included in the content of this study. This research can ensure an understating for researchers and educators into research trends in mobile learning.

2. METHOD

This review study aims to examine the current research literature in *mobile learning* and *distance education* for the years 2013 to 2017 in a context of higher education. Therefore, the authors found 11 research articles published during that time in 8 prominent peer-reviewed research journals. The research journals in which the articles selected are as below; (1) *TOJDE*, (2) *Learning Media and Technology*, (3) *Computers in Human Behavior*, (4) *Procedia- Social and Behavioral Sciences*, (5) *IJEDICT*, (6) *Engineering Science and Technology, an International Journal* (7) *Educational Technology, Research and Development* and (8) *the African Journal of Information System*. In particular, this review intends to address the following broadly focused research question: "What are the research purposes, methodologies, and outcomes addressed in current mobile learning studies?"

2.1. The Procedure of the Research

The articles included in this review were selected through a comprehensive search of publicly available literature, mostly through manual electronic searches of the following database: *EBSCO Discovery Service.* The database was accessed through the Anadolu University library network. Throughout the searches the keywords "*mobile learning*" and "*distance education*" were typed. Also while searching the related articles, the results were specified according to their publication years (between 2013 and 2017).

After a review of the literature and previous reviews, articles for this review were selected according to the following criteria: (a) the article was published between 2013 and 2017, (b) the article was published in English, (c) the article contained some discussion of the methodology used in order to obtain the data, and (d) the article related to mobile learning in higher education. Based on the criteria, 11 studies from 8 prominent peer-reviewed research journals were identified as eligible for the review and were comprehensively analyzed by three authors. The reference list of these articles and their coding as below (see Table 1):

Table 1. Codes of Articles and Their References

Codes of Articles	References
A1	Kabir, F. S., & Kadage, A. T. (2017). ICTs and Educational Development: The Utilization of Mobile Phones in Distance Education in Nigeria. *Turkish Online Journal of Distance Education, 18*(1), 63-76.
A2	Viberg, O., & Grönlund, Å. (2017). Understanding students' learning practices: challenges for design and integration of mobile technology into distance education. *Learning, Media and Technology*, *42*(3), 357-377.
A3	Sarrab, M., Elbasir, M., & Alnaeli, S. (2016). Towards a quality model of technical aspects for mobile learning services: An empirical investigation. *Computers in Human Behavior*, *55*, 100-112.
A4	Alrasheedi, M., & Capretz, L. F. (2015). An empirical study of critical success factors of mobile learning platform from the perspective of instructors. *Procedia-Social and Behavioral Sciences*, *176*, 211-219.
A5	Tagoe, M., & Abakah, E. (2014). Determining distance education students' readiness for mobile learning at University of Ghana using the Theory of Planned Behavior. *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, *10*(1), 91.
A6	Almaiah, M. A., Jalil, M. A.& Man, M. (2016). Empirical investigation to explore factors that achieve high quality of mobile learning system based on students' perspectives. *Engineering Science and Technology, an International Journal*, *19*(3), 1314-1320.
A7	Joo, Y. J., Kim, N., & Kim, N. H. (2016). Factors predicting online university students' use of a mobile learning management system (m-LMS). *Educational Technology Research and Development*, *64*(4), 611-630.

A8	Adedoja, G., Adelore, O., Egbokhare, F., & Oluleye, A. (2013). Learners' acceptance of the use of mobile phones to deliver tutorials in a distance learning context: A case study at the University of Ibadan. *The African Journal of Information Systems, 5*(3), 3.
A9	Briz-Ponce, L., Pereira, A., Carvalho, L., Juanes-Méndez, J. A., & García-Peñalvo, F. J. (2017). Learning with mobile technologies–Students' behavior. *Computers in Human Behavior, 72*, 612-620.
A10	Ozan, Ö. (2013). Scaffolding in connectivist mobile learning environment. *Turkish Online Journal of Distance Education*, *14*(2), 14-55.
A11	Setirek, A. C., & Tanrikulu, Z. (2015). Significant Developmental Factors that can Affect the Sustainability of Mobile Learning. *Procedia-Social and Behavioral Sciences*, *191*, 2089-2096.

2.2. The Data Analysis

For each article, the abstract and the methods section were read to guarantee the article met the presence criteria for this study by the researchers through the data analysis. the researchers checked whether there was a method section in each article. If there was no methods section, the article was scanned for any indication of a methodology. Then, each article was coded as to its research methodology: quantitative, qualitative, or mixed. An article was named qualitative if the data collected were qualitative in nature; or the data were in narrative form without using statistics or quantitative data Moreover, an article could be named as quantitative: if there was word *quantitative* in the abstract, methods, or data-collection section; or/and the data collected contained any quantitative data or reported using any quantitative method. Finally, an article was coded as mixed methods: if the data were gathered from both quantitative and qualitative sources; and the data for both the qualitative and quantitative sources were reported in the results section (Creswell, 2009).

The methodologies used in the articles were coded separately according to the criteria above by each researcher for the reliability of the analysis (see Figure 1). Furthermore, each researcher analyzed the articles whether there were any common themes applied. Each of the authors coded separately the research topics applied in the articles; after then a common framework for the research topics of the articles was drawn (see Figure 2).

3. RESULTS

The result of the analysis showed that the methods applied in more than a half of the articles (6/11) were quantitative (A4, A5, A6, A7, A9 and A11). All of these quantitative researches utilized questionnaires in order to collect the data. Only two of the articles preferred to use a mixed methodology throughout their research (A8 and A10). Moreover, a few of the studies (3/11) applied qualitative methodologies through their research (A1, A2 and A 3).

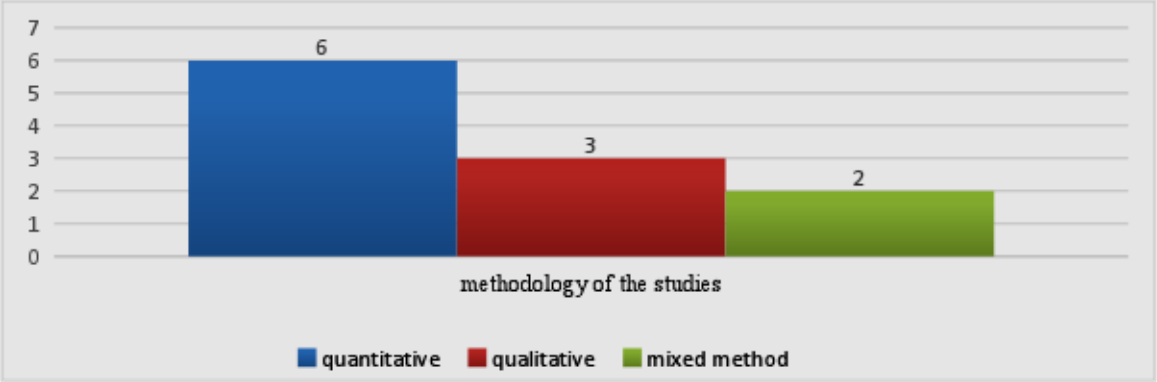

Figure 1. Methods Applied in the Articles

It was also noticed throughout the analysis of the topic that some research topics are popular in mobile learning research area. These popular research topics are learners' or educators' perceptions of m-learning and mobile technologies, quality issues of m-learning, students' acceptance of m- learning, review of mobile learning, connectivist m-learning, and sustainability of m-learning.

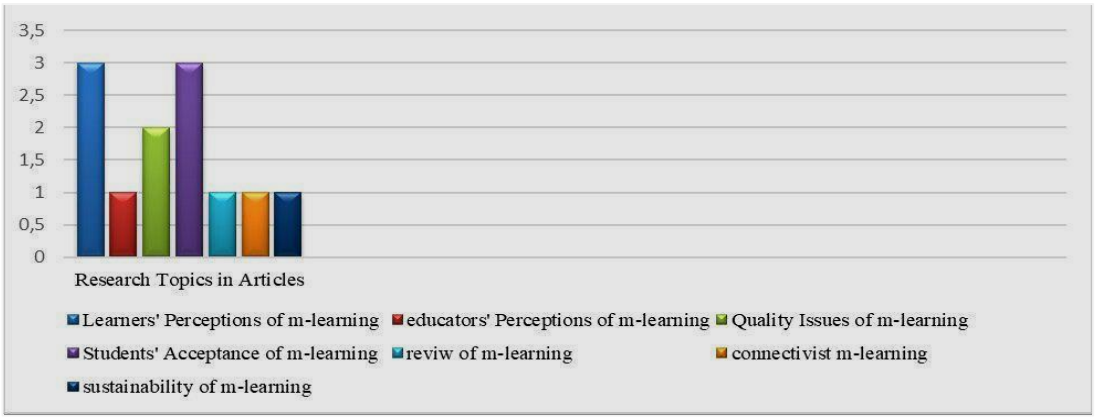

Figure 2. Research Topics in Articles

Some articles especially concentrated on either learners' or educators' perceptions of and/ or beliefs about mobile technologies and m-learning (A2, A4, A5 and A6). These studies are: how the language learners perceive mobile technologies-in- practice facilitate their language learning (Viberg and Grönlund, 2017); Tagoe and Abakah (2014) investigated how university students' beliefs influenced their readiness for m-learning using the Theory of Planned Behaviour (TPB); Almaiah, Jalil, and Man (2016) tried to explore quality factors for mobile learning system according to views of 392 University students; which various factors are thought to effect the success of mobile learning from the perspective of instructors (Alrasheedi and Capretz, 2015).

On the other hand, two articles (A3 and A6) focused on quality issues of mobile learning from different perspectives. First, Almaiah, Jalil, and Man (2016) proposed that in order to understand how to best exploit and use the mobile learning system for learning in universities,

the first step is to understand the students' perspectives and perceptions of the mobile learning system. For this reason, in the study they proposed and tested three frameworks for achieving high quality mobile learning systems according to students' perceptions. Then, Sarrab, Elbasir and Alnaeli (2016) put forward a model for the adoption of a complete and well-defined set of technical quality aspects for mobile learning development and their adoption in the education environment. Their proposed model captures most abstract and generic technical aspects of mobile learning service quality, including availability, fast response times, flexibility, scalability, usability, maintainability, functionality, reliability, connectivity, performance, user interface and security. The researchers tested this model via 4 different widely used M-learning platforms.

Also, the analysis of the articles displayed that three studies (A7, A8 and A9) examined students' acceptance of mobile technologies and mobile learning using *the Technology Acceptance Model* (TAM). For instance, Joo, Kim and Kim (2016) investigated which factors influence online university learners' actual usage of a mobile learning management system (m-LMS) via applying questionnaires to them. Furthermore, Adedoja and her colleagues' study (2013) focused on students' acceptance of mobile phones for learning purposes within a project. In this project the researchers aimed to support and engage distance learners by using mobile phones for distance learning lessons, rather than using mobile technology only for communicating information or creating access to learning resources. Finally, Briz-Ponce and her colleagues (2017) studied what kind of factors that could have influence in students' behaviour using mobile technologies for learning, which factors will contribute to make institutions or universities promote their acceptance of technology and improve the needed resources to succeed a better quality in education by applying a survey which theoretically based on TAM (*Technology Acceptance Model).*

Unlikely, some articles emphasized different aspects of mobile learning research area (A1, A10 and A11). First, Kabir and Kadage (2017) in their study highlighted the vitality of implementation mobile learning in Nigeria by showing a number of successful Mobile Learning initiatives through a review. Then, Ozan (2013) brought a connectivist and Vygoskian perspective to m-learning research; and, she investigated how to provide scaffolding to the learners in connectivist mobile learning environment: (a) to learn in a networked learning environment, (b) to manage their networked learning process, (c) to interact in a networked society, and (d) to use the tools belonging to the network society. In conclusion, Setirek and Tanrıkulu (2014) explored factors influencing m-learning sustainability and identified the present design and development position of mobile learning (for detailed illustration see Table 2).

Table 2. Purpose, Methodology and Outcomes of the Articles

Article	Purpose of the study	Methodology of the study	Research outcomes
A1	To highlight the vitality of application of mobile learning in Nigeria by illustrating a number of successful Mobile Learning examples	Qualitative (review)	Even if its high potential of use in educational settings, there are some challenges in order to sustain and succeed in the implementation of mobile learning in Nigeria.
A2	To investigate how students use mobile technologies and how they perceive that these technologies-in-use help their language learning.	Qualitative/ interpretive (interviews/ structurational analysis)	Designs for mobile applications need to consider that (i) students use their private mobile technologies frequently when conducting self-initiated learning tasks, (ii) students' mobile technologies in-practice are important, and course designers should design materials and tools for such use practices, and (iii) students prefer to work on their own due to the limited time they want to devote to their learning.
A3	To propose a model for the adoption of a complete and well-defined set of technical quality aspects for mobile learning development and their acceptance to use in the learning environment	Qualitative (case study)	The presented case studies point to a set of contextual technical quality factors that influence the choice of mobile learning application. The findings also indicate that there are causal relationships between learner satisfaction and the overall proposed model technical quality aspects. The model has a positive impact on overall learning process outcomes by evaluating the technical aspects while maintaining the quality of mobile learning delivered.
A4	To present a research model for evaluating how and to what extent different factors affect educators' views on the use of mobile learning at universities	Quantitative (questionnaires)	Interestingly most of the instructor population was found to be technically savvy and very comfortable with owing and using advanced mobile phone devices. The use of internet was also universal and a majority of the population accessed internet from their mobile devices.
A5	To explain how learners' beliefs influenced learners' intention to accept mobile learning and determine their mobile learning readiness using the Theory of Planned Behavior (TPB)	Quantitative (questionnaires)	The study found that there was high penetration of mobile phones among the students. Young students were more likely to have smart phones that their older colleagues. The results provide valuable information on ways to implement m-learning programs incorporating the voice and needs of students
A6	To explore quality factors for mobile learning systems based on students' perspectives via proposing and testing three frameworks	Quantitative (questionnaires)	Overall, the results of this study offer an empirical support for identifying the guidelines that contribute to design and development of high quality mobile learning systems based on students' perceptions.

A7	To analysewhich factors effect online university learners' actual usage of a mobile learning management system (m-LMS) through a structural model	Quantitative (questionnaires)	Results showed that perceived ease of use predicted perceived usefulness, but expectation-confirmation was not related to perceived usefulness. Perceived usefulness and expectation-confirmation predicted satisfaction. Perceived usefulness and satisfaction predicted continuance intention, but perceived ease of use was not related to continuance intention. Continuance intention predicted actual usage of m-LMS.
A8	To focus on students' adoption of mobile phones for learning purposes within a project that aims to support and engage distance education learners by using mobile phones for distance learning lessons, rather than using technology only for communicating information or creating access to learning resources.	Mixed Method (questionnaires, open ended questions, focus group discussions)	The evidence gathered confirms that the mobile tutorials enhanced teaching and learning. However, it also highlights several preconditions for successful implementation, including providing technical support to students, using a well-designed interface, improving student literacy, controlling the messaging and data costs faced by students, and improving the capacity of course developers and technical staff.
A9	To research what kind of factors and drivers that could influence students' behavior for the use of mobile technologies for learning	Quantitative (questionnaires)	Social Influence raised to be an important factor towards the Attitude and Behavioural Intention of using Mobile Learning. In addition, the student's ease of perception seems to be the main factor affecting the Social Influence (31.9%) and the reliability for recommending this technology for learning was the main factor that affected the Behavioural Intention. Findings provide support for Technology Acceptance Model.
A10	To investigate how to provide scaffolding to the learners in connectivist mobile learning environment	Mixed-method (holistic single-case study and descriptive statistics)	Learning moves into an informal, networked, technology-enabled arena**.** Generally, participants had positive perceptions toward the mobile connectivist scaffolding activities that support them and allowed them to share their knowledge in authentic
A11	To investigate which factors effect mobile learning sustainability and identify the current design and development status of mobile learning.	Quantitative (questionnaires)	The study may provide guidelines to assist m-learning initiatives in sustaining an effective mobile learning in terms of design and development

4. CONCLUSION, DISCUSSION and SUGGESTIONS

Three previous literature review-based studies (Hwang and Tsai, 2011; Hung and Zhang, 2011; Wu and others, 2012) on the use of mobile learning was provided precious results. However, they didn't analyze the most used research purposes. This study reviewed the literature to provide an extensive analysis of past studies from 2013 to 2017 and explained mostly used purposes on articles. The results of this study can be summarized as follows. The most popular topics are learners' perceptions of mobile technologies and m-learning and

students' acceptance of m-learning. On the other hand, there are two articles concentrated on quality issues of mobile learning from different perspectives. The others emphasized different aspects of mobile learning research area.

Two previous literature review-based studies (Hwang and Tsai, 2011; Hung and Zhang, 2011) didn't include the search methods of the studies into their research. However the review study was done by Wu and others (2012) found that among the 164 studies, surveys were the most used research method (50 studies), experimental research methods (38) were followed. It is stated that quantitative approaches were preferred by the researchers. The result of the analysis of this study showed that the methods applied in more than a half of the articles were quantitative. These researches utilized questionnaires in order to collect the data. Besides, a few of the studies applied qualitative methodologies through their research. However, only two of the articles preferred to use a mixed methodology throughout their research. It supports previous research (Wu and others, 2012) as a result of the more frequent use of quantitative research. Referring to experimental studies in the previous article (Wu and others, 2012) is a difference between two articles. This difference might be welded from the number of articles included in the study and the fast developments in the mobile technologies.

Considering the results of this study, some inferences can be advised to the future researches: In this study, only the aims and methods of the researches were investigated.

- In subsequent studies, the different ways of researches can be examined. For example, the most frequently used keywords and the profile of participants involved in the researches can be analyzed.
- This study was conducted between 2013-2017 years. A review of the last 10 years will provide a more detailed overview of the relevant topic.
- Web of Science or SCOPUS which is the world's largest database can be used instead of EBSCO.

Mobil Öğrenmede Güncel Çalışmalara Yönelik İçerik Analizi

Özet

Teknolojik gelişmeler eğitim sistemlerini etkilemektedir. Eğitim ortamlarının okullarla sınırlı olmadığı anlaşılmıştır. Bilgisayar kullanımı ve eğitim sistemlerinde internet ile bilgiye ulaşma yolları değişmiştir ve mobil öğrenme gibi kavramlar ortaya çıkmıştır. Son yıllarda, mobil öğrenme (m-öğrenme) uzaktan eğitimin önemli bir bileşeni olmuştur. Bu nedenle bu çalışmanın amacı literatür taraması yaparak literatürdeki araştırma bulgularını özetlemektir. Bu kapsamda, 2013 ile 2017 yılları arasında yayınlanan araştırmalar bu çalışmanın içeriğine dahil edilmiştir. Araştırma süresince, 8 önde gelen, hakemli araştırma dergisinde yayınlanan 11 araştırma makalesi incelenmiştir. Bu araştırmaların amaçları, metodolojileri ve sonuçları açıklanmıştır. Mobil öğrenme ile ilgili araştırma eğilimlerini ortaya çıkarmaya çalışması açısından bu çalışmanın önemli olduğu söylenilebilir.

Anahtar Kelimeler: Mobil öğrenme, uzaktan eğitim, teknoloji, mobil teknoloji.

About the Author(s)

Abdulvahap SÖNMEZ

After having graduated from English Language and Literature, he did his post graduate on post-colonial era literature at Yuzuncu Yil University. He is a PhD student of Distance Education department at Anadolu University.

Mailing Address: Anadolu University, Social Sciences Institute, Yunusemre Campus, Eskişehir, Turkey
Tel: +90 222 3350580
Email: abdulvahapsonmez@gmail.com

Lütfiye GÖÇMEZ

The author graduated from the department of English Language Teaching at Mersin University in 2007. She got her Master of Arts degree from the department of English Language Teaching at Gazi University in 2014. She is a PhD student at the department of Distance Education at Anadolu University. She works as a lecturer at the department of Foreign Languages at Aksaray University. She is interested in the following research areas: EFLT, distance language learning, open and distance education.

Mailing Address: Aksaray Üniversitesi, Yabancı Diller Yüksekokulu, Merkez/AKSARAY
Tel: +90 382 288 2385
Email: lutfiyegocmez@gmail.com

Derya UYGUN (Corresponding Author)

She graduated from Anadolu University, the department of English Language Teaching. She completed her master's degree at Anadolu University. She is still a PhD student in Distance Education department at Anadolu University. She is an English teacher at the Ministry of Education.

Address: Anadolu University, Social Sciences Institute, Yunusemre Campus, Eskişehir, Turkey
Tel: +90 222 3308110
Email: derya.u@gmail.com

Murat ATAİZİ

He is a professor at Anadolu University, Communication Science Faculty. He graduated from Anadolu University. He is interested in communication, social science, distance education and technology.

Address: Anadolu University, Communication Science Faculty, Yunusemre Campus, Eskişehir, Turkey.
Tel: +90 222 3308110
Email: mataizi@anadolu.edu.tr

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Examining the Interface of Lego Mindstorms Ev3 Robot Programming

İsmail KUNDURACIOĞLU [a]

[a] *Balikesir University,Balikesir, Turkey.*

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Review Article

Abstract

Today, the value of training of programming is increasing gradually, and this education is now given at elementary school level. Parallel to this, a wide variety of programming tools have been produced. As those who have just started to take traditional programming education and especially those who are in their early childhood years find this type of programming difficult, block programming languages have been developed. Learners who have just started to learn block programming can adapt themselves more easily to learning programming. With the spread of education on programming, block programming has developed, and a number of languages and materials have been developed for programming robots with blocks. One of the most popular of them is the Lego Mindstorms EV3 robot and software. The purpose of this study was to introduce the Lego Mindstorms EV3 robot used in programming education, to examine its software interface and to provide information about how to use it.

Keywords: Lego Mindstorms EV3, robot programming, programming education, coding education, educational robot

1. INTRODUCTION

Today, programming skills have become an important field of proficiency not only for people who work with computers but for all people from any professional area. The reason is that programming skills make important contributions to productivity and creativity. As the importance of programming skills has increased, the number of people who need these skills has increased as well, which has resulted in giving programming education to people at all ages (Demirer and Sak, 2016). Consequently, specific coding education materials have been developed for all ages and for all education levels.

As a general concern about programming, it is considered to be difficult and complicated. It is obvious that it is not easy to learn programming and that various difficulties are experienced in the process of being successful in programming courses (İmal and Eser, 2009; Başer, 2013; Saygıner and Tüzün, 2017). In order to overcome these difficulties, use of block-based visual programming languages is suggested. In one study, it was revealed that individuals can easily learn the logic behind programming and the concepts related to programming with the method of the drag-and-drop code blocks and that this method is user-friendly with its positive influence on individuals' motivation in programming (Yükseltürk, Altıok, 2016).

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Although there are a large number of studies conducted to spread robot education throughout the world, related studies conducted in Turkey are still rare in number. Studies and written sources regarding especially technological issues become out-of-date until they have been translated into Turkish, and in the process, the technology in question is replaced by another one. Throughout the world, there are now enough sources regarding the basic use and user-friendliness of the robot kit for interested researchers, teachers and students who are willing to use it. The purpose of the present study was to introduce the Lego Mindstorms EV3 robot used in programming education, to examine its software interface and to provide information about how to use it. Therefore, in the present study, a new and gradually-popular technology product, Lego Mindstorms EV3 robot and the blocks in its software interface were examined. Also, its use was elaborated by designing sample softwares.

2. LITERATURE

Today, the interest in programming has increased, and this interest has not been limited just to people working with computers but it has become a field of competence for all individuals. People are suggested to take programming education so that they can develop new projects using different technologies (Akpınar and Altun, 2014; Çakıroğlu, Sarı and Akkan, 2011). The most important reason is that programming education is considered to be beneficial for problem solving, for algorithmic thinking and for the development of creativity (Yünkül, Durak, Çankaya and Mısırlı, 2017). With the supports of governments and of various foundations in private industry, programming education has been initiated for individuals at all ages (Demirer and Sak, 2016). Programming education has become so wide-spread that coding classes, STEM (Science, Technology, Education and Mathematics) laboratories, robotic education areas have been opened at schools. As a result of these developments, programming languages and materials appropriate for all ages have been developed.

Without having to use any code for young students, drag-and-drop programming languages similar to the logic of jigsaw have been developed. These types of environments are called Block Programming, and Scrath, Code.org, Kodulab and App Inventor can be given as examples of these environments. In most of these environments, the logic and fundamentals of programming can be taught easily via simple tasks assigned to individuals (Code.org, 2017; Scratch, 2017; Kodulab, 2017). Recent studies have demonstrated that such visual programming environments such as Scratch, Lego Mindstorm and Alice considerably decrease the inefficiency and difficulty in learning programming for beginner-level information technologies. As visual programming environments provide a simple, exciting and entertaining atmosphere, they seem to be more appealing when compared to text-based programming environments (Schwartz, Stagner & Morrison, 2006; Lamb & Johnson, 2011; Lin & Liu, 2012).

Learning programming requires development of a different mentality. In programming languages, concretization will make it easier to minimize the negative influence of working with abstract concepts and to better understand the underlying logic. Therefore, use of

platforms like Arduino in programming education will facilitate things on behalf of students and avoid facing difficulty since these platforms will provide concrete feedback in relation to the codes (Ersoy, Madran and Gülbahar, 2016). Using the signals sent by sensors, Arduino is a physical programming platform to develop systems and robots which interact with the environment (Robotistan,2017). In one study carried out by Hubwieser, Giannakos and Berges (2015) at secondary school level in 12 countries, computer science curricula. The study summarized the objectives of the education, related competencies, course contents and the programming languages and environments were examined. The results of the study revealed that the programming tools popular in the 12 countries included hardware systems like Lego Mindstorms and Raspberry Pi. In another study conducted with secondary school students in Turkey, it was reported that all the participants preferred programming education given with robots to traditional programming (Çankaya, Durak, Yünkül, 2017).

Considering the fact that robots are increasingly prevalent in our lives today, it is now an inevitable need to use them in education. In many countries, robots are currently in use in such courses as mathematics and science and technology besides robot education (Fidan and Yalçın, 2012). Mindstorms EV3, Parallax Robotics Kits, MakeBlock Kits and Robo Mind can be given as examples of these tools. Most of these tools have their own specific languages, yet they all support such common languages as C#, C++, Python and Java as well (ev3dev.org, 2017).

3. LEGO MINDSTORMS EV3 PROGRAMMABLE ROBOT KIT

The Lego Mindstorms EV3 model examined in the study is widely used not only because it can easily be structured but also because it allows multi-faceted use. For this reason, it was selected to provide a source for researchers, students and teachers. The software of Lego Mindstorms EV3 Home Edition aims to make use of all the features provided by the robot. The software is quite easy to install and use. In addition, among its other alternatives, the software is popular due to its software interface which does not restrict its users.

3.1. Features of LEGO Mindstorms EV3

The Lego brick is the part that controls all the parts of the robot. This part includes slots for USB, SD card and charger and eight ports to connect the engines and sensors. In addition, a small-size screen and the buttons allow controlling it when not connected to a computer. The basic set of Lego EV3 includes:

1. EV3 intelligent brick
2. Three servo engines
3. One gyro sensor
4. One touch sensor
5. One color sensor
6. One ultrasonic sensor
7. Hardware parts to use for the construction of the robot (Lego, 2017).

Figure 1. Main Equipment Parts of Lego Mindstorms EV3 Education Set.

3.2. Features of LEGO Mindstorms EV3

After the parts of the robot are assembled as appropriate to the intended function, it should be programmed with the help of its own software (Lego, 2017). The software provided by Lego has quite an easy and user-friendly interface. Though it is easy to use, it can be used in many areas for various purposes. As long as the number of parts is sufficient, a robot which can serve multi-functions can be developed. In addition, programs were developed to examine the working principles of all sensors in detail. Also, samples including basic programming concepts were prepared and tested. For this purpose, the Mindstorms EV3 Home Edition 1.2.2 version was used.

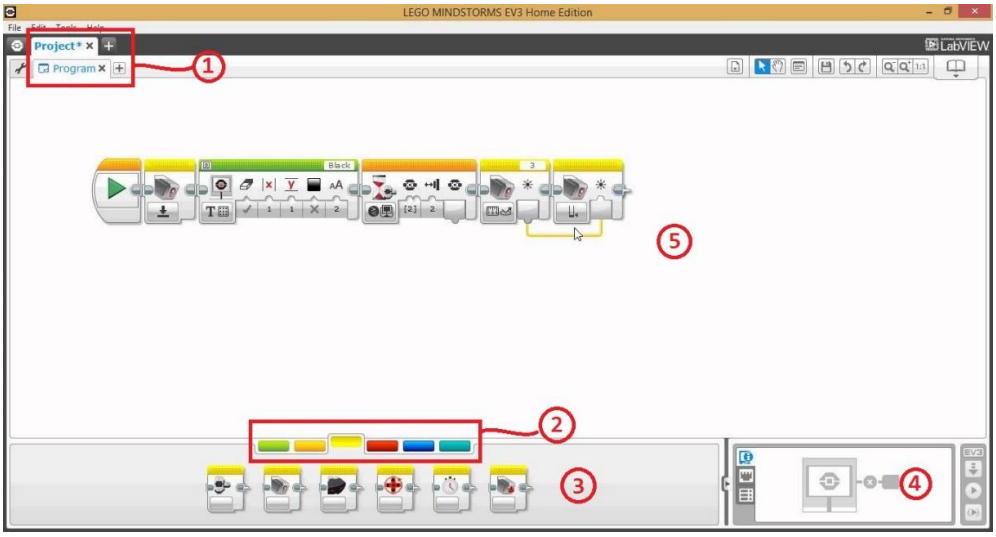


Figure 2. Lego Mindstorms EV3 Home Edition Software Interface

When the software interface is opened, the image in Figure 2 appears on the screen. The project and the programs in the project can be seen in section 1. Section 3 below includes the blocks to be used for programming. Section 2 presents the categories of blocks to be used. In section 4, the robot and the sensor values of the robot can be seen. Section 5 is where we can use the blocks with the drag-and-drop feature and form our program. The program can be developed by just using the drag-and-drop method without any knowledge of coding.

3.3. Robot Design

In the design, a totally personal method should be applied on the basis of one's needs. The robot in Figure 3, which is also found in the basic set guideline, was developed for the use of all the sensors and motors together with the parts in the Lego EV3 Basic Set. It does not have a specific shape, and it should be customized totally in line with the purpose. Therefore, before the designing process, it is necessary to determine for what purpose the robot will be used.

Figure 3. The robot developed

4. LEGO MINDSTORMS EV3 SOFTWARE INTERFACE

Lego EV3 works on block programming. The blocks to be used were gathered in five main sections: action, flow, sensor, data operations and advanced. Also, there is a tab called 'my blocks'. In this tab, the programmer can design blocks on their own as in objective programming.

Table 1. Variable structures used in the block structure.

Shape	Meaning
	Descender at the bottom: Outputs a value.
	Descender at the top: Inputs a value.
	Round descender: Inputs or outputs an integer value.
	Square descender: Inputs or outputs a text value.
	Triangle descender: Inputs or outputs a boolean value. Takes a correct or wrong value
	Two descenders: Shows an array. They keep the above meanings for the round, square or triangle.

4.1. Action Blocks

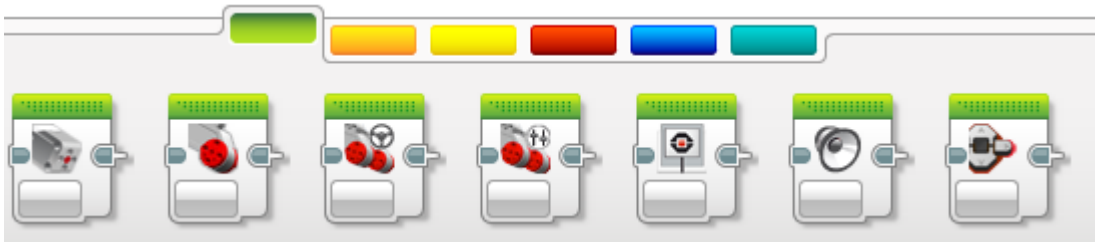
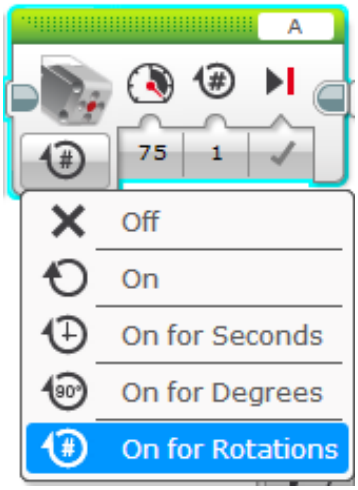
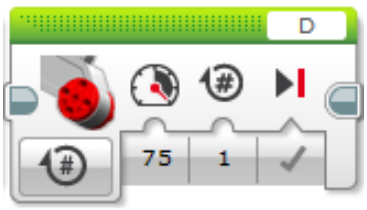
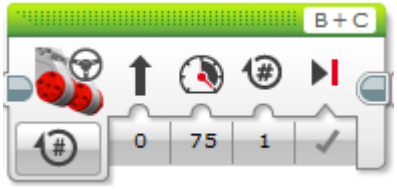
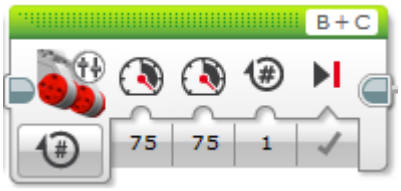
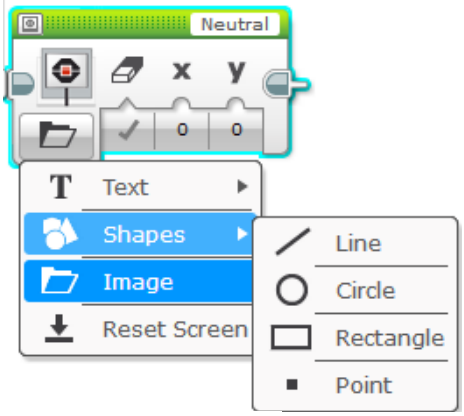
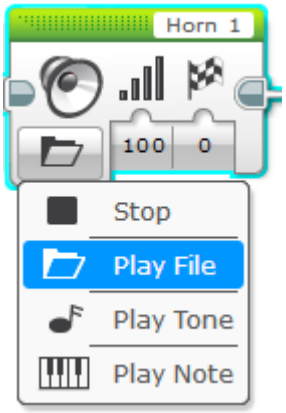
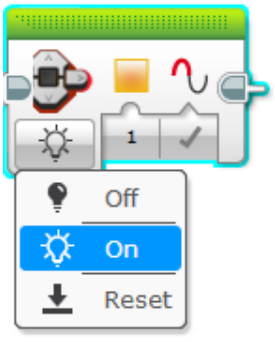


Figure 4. Action Blocks Menu

Action blocks allow controlling the movement of the robot with engines, its sound, its screen and the lights around the buttons under the screen. The action blocks also make it possible to control the physical functions of the robot.

Table 2. Action Blocks and Their Definitions

DEFINITION	BLOCK
Engines The engines are generally similar in terms of their use. We determine parameters for the command, power and number of revolutions and command and determine whether the engines will break when it ends. In addition, the commands can be set as power on/off for seconds, degrees and rotations. At the right top, the name of the port can be seen.	
Medium Motor The medium motor is the one that the lever is connected to in the robot we have designed. As it has a lower level of power when compared to large motors, it is generally used in this or similar forms.	
Large Motor These motors have the same principle of working as the medium motors. When compared to medium motors, large motors are powerful and two in number in each set. Therefore, they are generally used to give the power to tyres.	
Move Steering It allows controlling two large motors with a single block. As can be understood from the symbol of steering, it helps determine the direction of the movement of the robot. Also, we can determine the speed and rotation of the motors.	

DEFINITION	BLOCK
Move Tank Similar to move steering, it allows controlling two large motors. We can separately control the power transmitted to the motors rather than determining the direction.	
Display It allows controlling the display above the intelligent brick. We can put images, figures and texts on the display. The images, figures and texts are determined, and the x-and-y coordinates are set. We can clear the display before doing something else. In the motors, at the right top is the port which the motor is connected to, and on the display block is the name of the figure or that of the image and the text to be written.	
Voice It allows controlling the voices. After selecting the file to be played, the tone or the musical note, we select the volume and what it will do at the end. When it ends, it can stop, replay or continues to play until it is stopped within the program. As in the display, we can select the audio file, the musical note or the tone on the right top.	
Brick Status Light It allows controlling the lights behind the buttons on the intelligent brick. It can be selected as either on or off, and its color can be selected as yellow, green or red. We can determine whether it will only emit light or indicate a signal. It is generally used for warning in cases of certain conditions.	

4.2. Flow Blocks

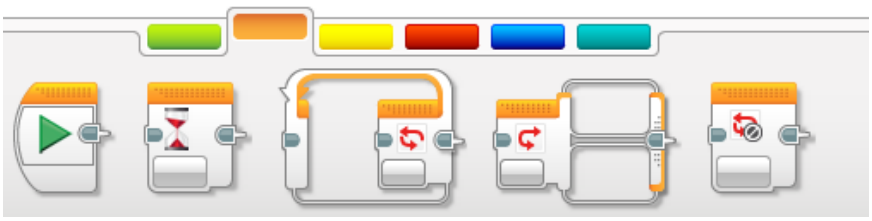
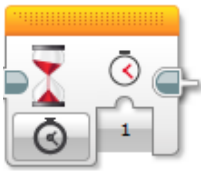
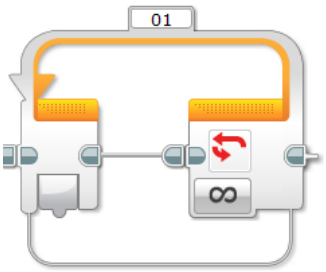
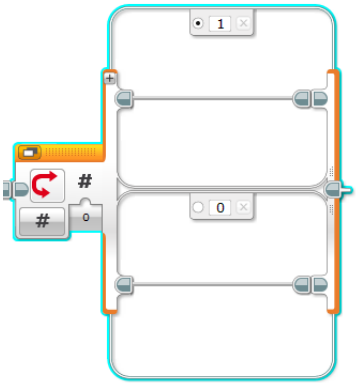


Figure 5. Flow Blocks Menu

Flow blocks allow managing the factors influential on the procedural structure by using the programming logic. These blocks help do the procedures of start, wait, loop, switch and loop interrupt.

Table 3. Action Blocks and Their Definitions

DEFINITION	BLOCK
Start This is the first block to work when the program is started. Any block added works next. When you want to do two or more procedures at the same time, you can give as many starting points as we want.	
Wait When it is time for the wait block, you cannot pass on to the next procedure until the specified time or procedure ends. The event can be determined based on the time, buttons or sensors.	
Loop For the repeating procedures, loops are used. Loops can either work depending on the time, number of repetitions, the result of the procedure, buttons or sensors or work everlastingly. In the case of working everlastingly, “interrupt” is used generally. Everlasting working is also used when you do not want the program to shut down automatically.	
Switch It is used when you want to do conditioned redirection or make changes in the flow of the program. While using the switch, a parameter is set for the condition, and new flows are determined for its possible values. The switch parameters can be the result of a procedure, buttons, sensors or a variable which shows a previously value-assigned integer, text or boolean value.	
Loop Interrupt This is the block that allows leaving the loop without providing any condition. In general, it is found in a switch, and when the specified conditions are achieved, it allows going out of the loop.	

4.3. Sensor Blocks

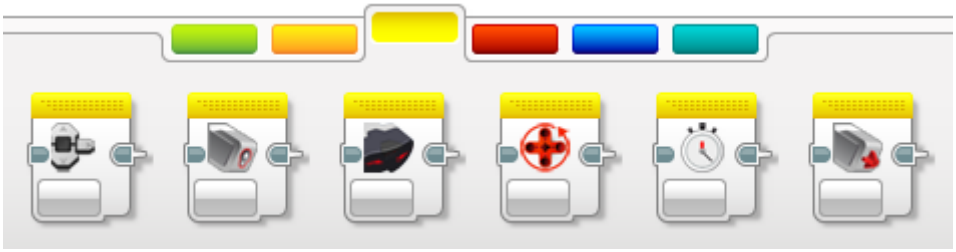
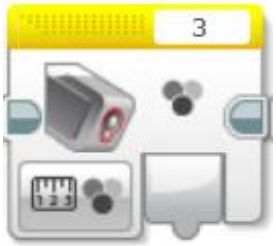
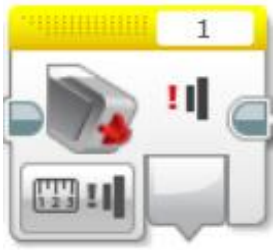


Figure 6. Sensor Blocks Menu

Sensors are the additional parts that allow the robot to obtain data from outside. The sensors are generally used in loops and switches. Since sensors can be used directly in an integrated manner in the loops and switches, there is generally no need to use these blocks. If the purpose is directly to read the value that the sensor reads, then sensor blocks are used for this purpose.

Table 4. Sensor Blocks and Their Definitions

DEFINITION	BLOCK
Brick Buttons It allows reading the value of the buttons found on the brick. Each button has a reference number. The block outputs the number that the button pushed belongs to. If more than one button is pushed, it outputs a serious of numbers.	
Color Sensor Each color in the color sensor has an integer value. It prints the numerical value instantly for the color it detects. When the color sensor is set, it could receive the reflected light or the light in the environment instead of the colors. Thanks to this, measurements like the day and night difference.	
Infrared Sensor The infrared sensor is used to measure the distance with the wall in front of the sensor or with any object. It can be used to stop before hitting an obstacle or to get directed towards a target.	

DEFINITION	BLOCK
Motor Rotation It allows reading the instant degree of the selected motor, its number of rotation and its power. Normally, we give these values in motors. However, these variables are complicated as programs become complex. Therefore, it is a needed block.	
Timer The timer is used to measure the time between the procedures or for the program to wait for the duration of certain procedures. When we have to do a time-based procedure, we define a timer, which works in the background.	
Touch Sensor We can use it not only like a remote controller but also to do a new task in case of an obstacle. It can be used in three ways: the pushed button, the released button released, and push-and-release button.	

4.4. Data Processing Blocks

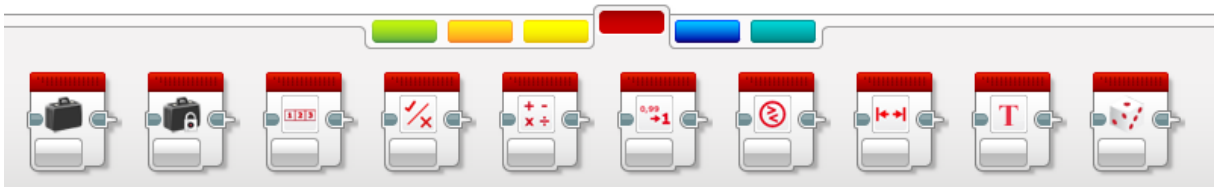
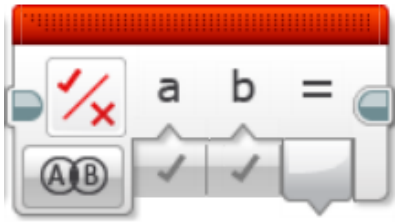
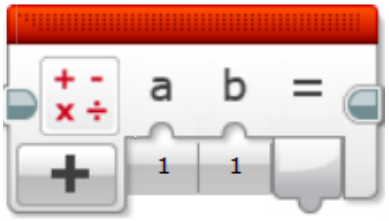
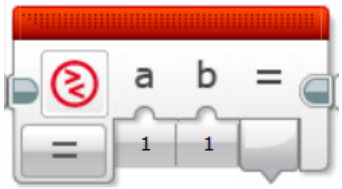
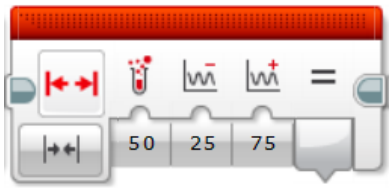
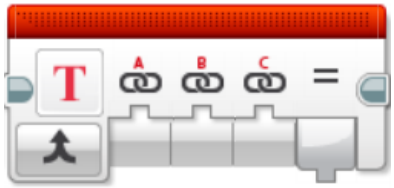


Figure 7. Data Processing Blocks Menu

The definition of arrays, constants, variables and many other procedures to be done while doing programming are done by using data processing blocks. It is necessary to make certain related definitions. For the definition of the values to be used in the program, variables are used if the value is to change, and constants are used if the value is constant. If we want an object to keep a record of several numbers separately; to illustrate, if we make a definition for colors and want to keep the colors of red and blue, then we need to define an array called colors. The first element of this array can be used as red and the second as blue.

Table 5. Data Processing Blocks and Their Definitions

DEFINITION	BLOCK
Variable Variables are defined and recorded for values like boolean, texts and integers to be used in programming. Thanks to this block, a value can be assigned by defining a variable, and the value of a defined variable can be read.	
Constant Some variables like the Pi number in Mathematics never change. These unchanging definitions are called constants. This block is used to define a constant and to read the value of a defined constant.	
Array Operations Arrows allow keeping a number of values in a single variable. This block is used to add an element to an arrow or to remove it from the arrow.	
Logic Operations Consequently, procedures returning as boolean value are called logical procedures. In general, it is used to check whether the specified conditions have been met or not.	
Math It is a block that allows doing mathematical procedures. The result is calculated by defining a special procedure like addition, subtraction, multiplication, division, absolute value, square root and exponent.	
Round It allows rounding fractional numbers to the closest lower or higher integer, and the closest value is found. It is preferred in cases which do not require elaborated calculation.	
Compare It is a block returning the result as a boolean value by comparing whether one value is higher or lower than or equal to another value.	

DEFINITION	BLOCK
Range It is a block which checks whether the value is in the specified range and which returns the result as a boolean value.	
Text This is a block that allows combining the defined text variables. It is generally used to combine the constants and variables.	
Random It gives a random result for a boolean value by entering a percentage or a number in the specified range.	

4.5. Advanced Blocks

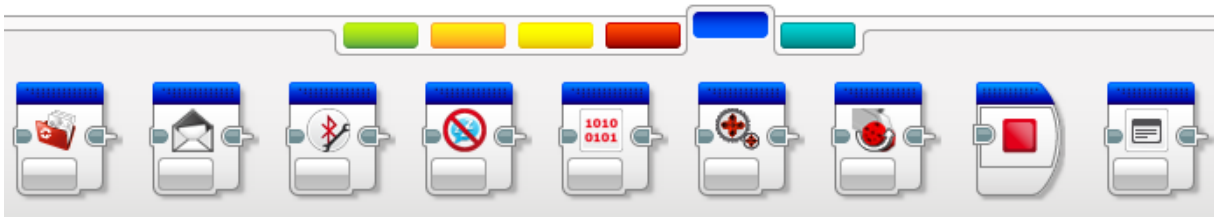
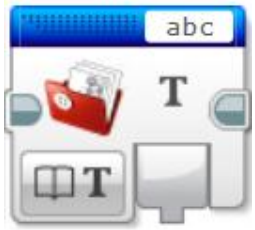
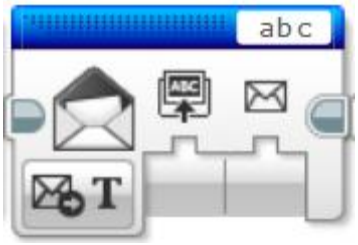
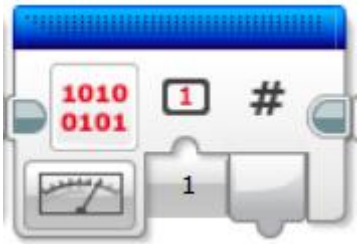
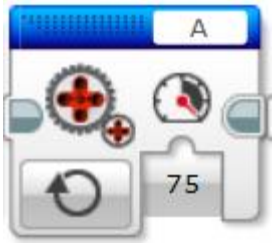
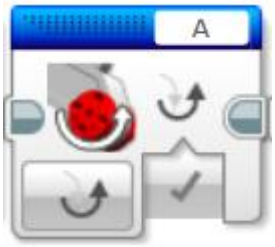
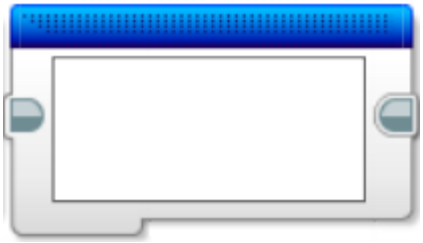


Figure 8. Advanced Blocks Menu

Procedures which will actually be mostly necessary for advanced programming and which are thus not needed in general can be seen in the tab of advanced.

Table 6. Advanced Blocks and Their Definitions

DEFINITION	BLOCK
File Access The file access block is used to delete the file we have uploaded to the robot, to read a variable in the file, to write in the file and to close an open file.	
Messaging The messaging block allows the robot to send a message or to read and evaluate a received message. Also, the message received is processed in this block.	
Bluetooth This is a block that allows to activate and deactivate the bluetooth feature of the robot, to connect another device via bluetooth or to end a current connection.	
Keep Awake This block allows keeping a value regarding how long the device has been working.	
Raw Sensor Value It shows the instant value that the sensor has in the selected port.	
Unregulated Motor It allows updating the power of the motor in the selected port. It is used when it is necessary to change only the power without changing any other value.	

DEFINITION	BLOCK
Convert Motor It allows changing the direction of the motor in the selected port. It is used when it is necessary to change only the direction without changing any other value.	
Stop Program It is used to determine the end of the program. It is generally not used as the program will stop when the procedures are completed.	
Comment There is a need for adding a comment line between commands in big projects. This need can be met thanks to a comment block in block programming. It does not have any effect on the program.	

4.6. Sample Applications

Motor Control: It moves the lever in front of the robot up and down. It moves upwards slowly and downwards fast, and it repeats these movements five times.

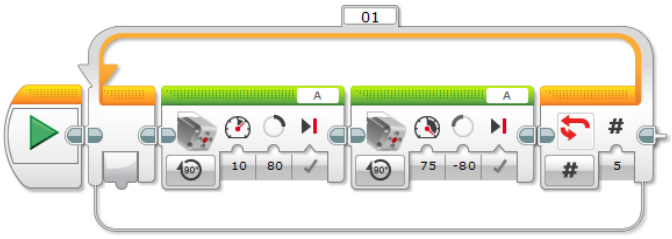


Figure 9. Sample Motor Control

Display Control: An animation of blinking has been formed in the display on the robot. Its eye is open for two seconds and closed for two seconds, and it has been programmed in a way to repeat this five times.

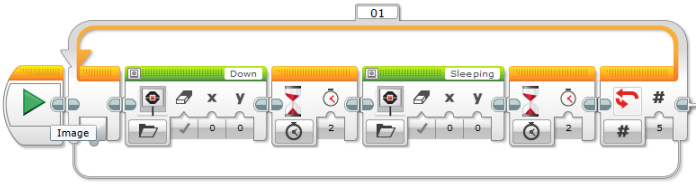


Figure 10. Sample Display Control

Movement Control with the Light Sensor: If the ground is red, the motors work with the light sensor placed with its face looking at the ground in front of the robot. It is repeated until the program is ended.

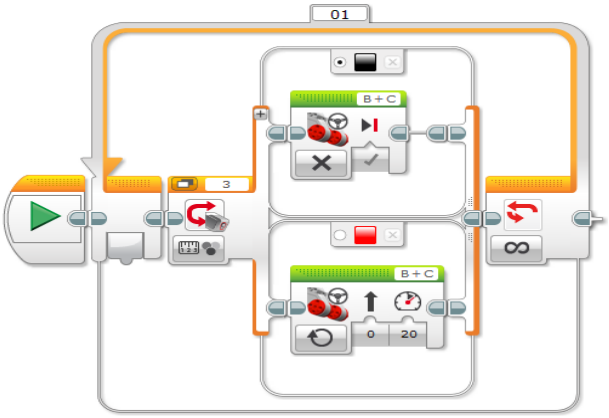


Figure 11. Sample Light Sensor

Movement control according to the distance with the infrared sensor: Thanks to the infrared sensors in front of the robot, it detects the obstacle and stops the movement if there is an obstacle in a distance of five centimeters. In other words, if there is no obstacle, the movement continues. It is repeated until the program is ended.

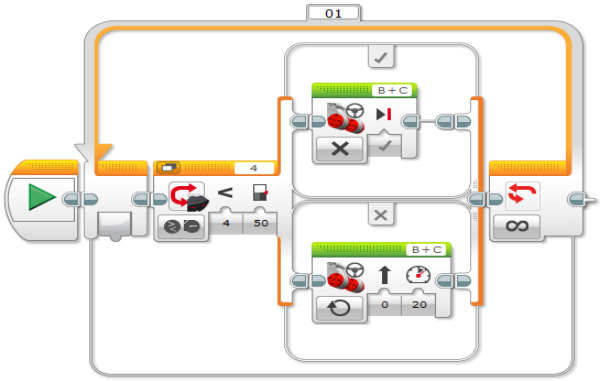


Figure 12. Sample Infrared Sensor

Movement control with the touch sensor: It stops when the touch sensor is pressed, and it continues its movement if not. The touch sensor can be used when it hits an obstacle, and we can take and control it in our hands like a remote controller.

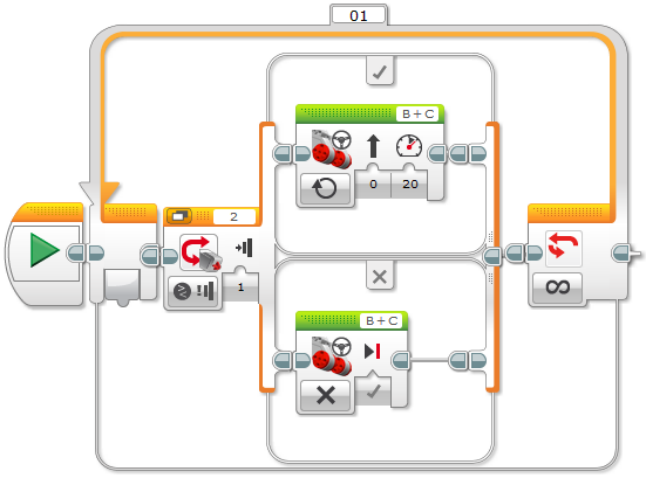


Figure 13. Sample Touch Sensor

Addition: It is a program that adds two entered numbers and shows on the display. First, two variables named a and b, and then values are assigned. Following this, the values are read and subjected to the procedure of addition. The result obtained is shown on the display.

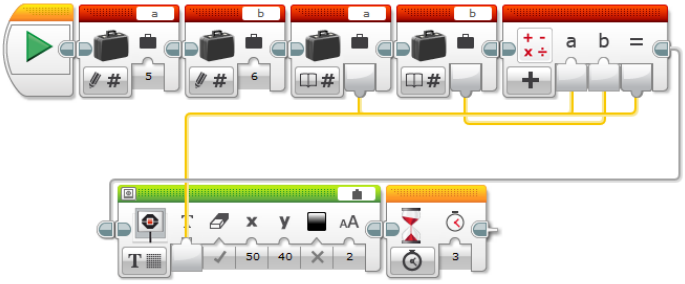


Figure 14. Program for Addition

5. CONCLUSION AND SUGGESTIONS

When the Lego Mindstorms EV3 robot education set is examined, it is seen that it is quite easy to install and use it. In addition, as the parts in the set are compatible with each other, the individual who formed a robot with the Lego Mindstorms EV3 robot set does not experience and problem of incompatibility between the parts when compared to other alternative robot sets. The robot can obtain information from the environment with the help of the sensors. Also, it can provide feedback via sounds, light and movement. Its additional features like data storage and calculation via data processing broadens its area of use.

In contrast with the related bias, it is fairly entertaining and instructional to design and code a robot with the Lego Mindstorms EV3 robot education set. In traditional programming languages, the software design and commands to be learned make learning rather difficult and require a long process. Block programming allows using an easier software design without any need for memorizing commands. Thanks to this, an individual who does not have any knowledge of programming can do coding easily with the help of the Lego interface. As can be seen in the sample applications, the coder has a good command of program hierarchy and flow when compared to traditional programming. In order to start programming education, the Lego Mindstorms EV3 robot education set will accelerate learning and make it more entertaining thanks to the visual quality of the program design and blocks as well as to user-friendliness of the interface. In addition, as the parts are in the form of jigsaw puzzle, it could be stated that elementary school students taking education with this set will develop their scientific and mathematical thinking and intelligence.

Within the scope of the present study, the influence of coding interface, not that of Lego EV3, on learning and teaching processes and its usability in coding education were examined. For this purpose, sample programs were developed and tested on the robot. In this respect, the study aimed to draw attention to a relatively new technology used in programming education, to introduce it to teachers and researchers and to prepare a guideline for those willing to use it.

The Lego Mindstorms EV3 robot education set is prominent with its features such as user-friendliness, compatible parts and the easy-to-understand coding screen when compared to other coding tools and robot sets. Thanks to these features, its use in the courses of robotics and coding newly included in education is thought to produce positive results, as can be seen in related studies in literature, and to be influential on increasing students' motivation and interest in coding.

Lego Mindstorms Ev3 Robot Programlama Arayüzünün İncelenmesi

Özet

Günümüzde programlama eğitiminin değeri giderek arttığı ve bu eğitimin ilkokul düzeyinde verilmeye başladığı görülmüştür. Bununla paralel olarak programlama araçları da çeşitlilik kazanmıştır. Klasik programlama eğitiminin yeni başlayanlar ve özellikle yaşı küçük çocuklar için zor olabilmesi nedeniyle blok programlama dilleri geliştirilmiştir. Blok programlama şeklinde yeni başlayan öğrenenler programlama öğrenmeye daha kolay adapte olmaktadır. Programlama eğitiminin yaygınlaşmasıyla blok programlama da gelişmiş ve robotların bloklarla programlanması için birçok dil ve materyal geliştirilmiştir. Bunlar arasında en yaygın olarak kullanılanlardan biri Lego Mindstorms EV3 robotu ve yazılımı olmuştur. Bu çalışmanın amacı programlama eğitiminde kullanılan Lego Mindstorms EV3 robotunu tanıtmak, programlama arayüzünü incelemek ve nasıl kullanılabileceğine yönelik bilgiler vermektir.

Anahtar Kelimeler: Lego Mindstorms EV3, robot programlama, programlama eğitimi, kodlama eğitimi, eğitsel robot

About the Author(s)

İsmail KUNDURACIOĞLU

İsmail Kunduracıoğlu has got bachelor's degree (BS) from Süleymen Demirel University, department of computer engineering in 2015. He has been continuing his academic life as a graduate student in Balıkesir University, Department of Computer and Instructional Technologies Teacher Education while he is working as a software specialist in private sector. His interest areas are web programming, e-commerce, robot software, gamification and game programming.

Mailing Address: Balikesir Universitesi, Necatibey Eğitim Fakültesi, Bilgisayar ve Öğretim Teknolojileri, Altıeylül, Balıkesir, Turkey 10100
GSM : +90 551 971 79 70
E-mail : kunduracioglu@yandex.com

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Flipped Classroom Model and Practical Suggestions

Mehmet URFA[a]

[a] *Army NCO Vocational College, National Defense University, Turkey.*

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Review Article

Abstract

Rapid changes in information and communication technologies have increased learners' expectations, which have caused researchers to search for new and effective ways of learning. In this respect, with the combined use of the advantages of both traditional learning models and distance education, use of blended learning models has become popular. The flipped classroom model, one of such blended models, has frequently been on the agenda in recent years. For the purpose of examining the applicability of the flipped classroom model, a number of studies in related literature have been conducted on this model, which can be defined briefly as the replacement of homework assignments with class teaching. The purpose of the present study was to investigate the application of the flipped classroom model increasingly popular in Turkey as well as in the world and to examine its application areas, the components necessary for an effective application of the flipped classroom model, the benefits of the model and the problems likely to be experienced in the application process of the model.

Keywords: Blended learning, flipped classroom model, communication technologies

1. INTRODUCTION

The rapidly developing and changing information and communication technologies have influenced the society and individuals in many areas of life including business, communication and education, and these technologies are of great importance in practices in these areas. With the increase in learning opportunities especially in the field of education, the need for integration into globalized learning environments has increased as well (Gençer, 2015). In line with this purpose, starting from 1980s, computerized learning started to be independent of face-to-face teaching and removed such limitations as age, place and time (Demirkan, Bayra and Baysan, 2016). Spread of use of the Internet, phones, tablets and computers provided students with the opportunity to continue their education lives out of school. With the help of these devices, students can go on their education independently of time and place, reach rich educational sources and thus continue their education lives out of class. This allows saving extra class time and contributes to individual development of students (Yavuz, 2016).

The changes in living standards altered students' learning preferences, and the need for active learning environments appropriate to individual learning methods that can be applied to individuals' own pace of learning. According to related literature, homework assigned in courses given with traditional methods is considered by students and their parents to be a

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source of stress (Walker, Hoover-Dempsey, Whetsel and Green, 2004). It is reported that students do not know what to do and how to do it and thus do their homewrok wrongly and that their parents can not help their children with their homework and thus become prejudiced against school (Turanlı, 2007; Ersoy and Anagün, 2009), and that there are other studies revealing that students can not participate sufficiently in in-class applications in courses taught with tradtional methods (Durak, Çankaya, Yünkül and Öztürk, 2017). These types of difficulties caused researchers to look for new and effective methods to increase the effectiveness of learning in face-to-face teaching processes (Doğan, 2015). In this respect, computerized and web-aided learning environments, which are considered to involve traditional and innovative teaching methods, started to be adopted and used together.

With the developments in digital learning technologies, these technologies started to be used in face-to-face learning environments, and blended learning methods occurred in the field of education with the combined used of beneficial aspects of face-to-face and distance education methods (Ünsal, 2012; Geçer, 2013). Blended learning environments allow learning both in traditional face-to-face class environments and in digital environments (Singh, 2003). Blended learning is a new teaching paradigm used now in mixed class environments which combines the traditional face-to-face class environments with out-of-class online multimedia technologies and which is based on student-centeredness rather than on teacher-centeredness (Huang and Kinshuk, 2013).

The Flipped Classroom (FC) model, one of blended learning approaches, has been on the agenda frequently in recent years. The FC model is a blended learning model which transfers the presentation of content in traditional classroom environment to an online platform, which transfers learning activities planned to be carried out by students at home to traditional classroom, and which allows these activities to be enriched and carried out under the guidance of the teacher (Demiralay and Karataş, 2014). In another saying, FC model is a system which replaces in-class teaching with the homework assigned for students as reinforcement, which supports students' individual learning, and which helps develop their problem-solving skills (Bishop and Vergeler, 2013). FC model, a new field of study and learning method In Turkey as well as in the whole world, allows students to learn in an active, flexible and cooperative learning environment and provides them with the opportunity to apply their theoretical knowledge.

When studies on FC model are examined quantitatively, it was found via the search on EBSCO databases using the key words of "Flipped Classroom" that a total of 6889 studies have been filtered starting from the year 2011. The distribution of these studies in number can be seen in Figure 1 below.

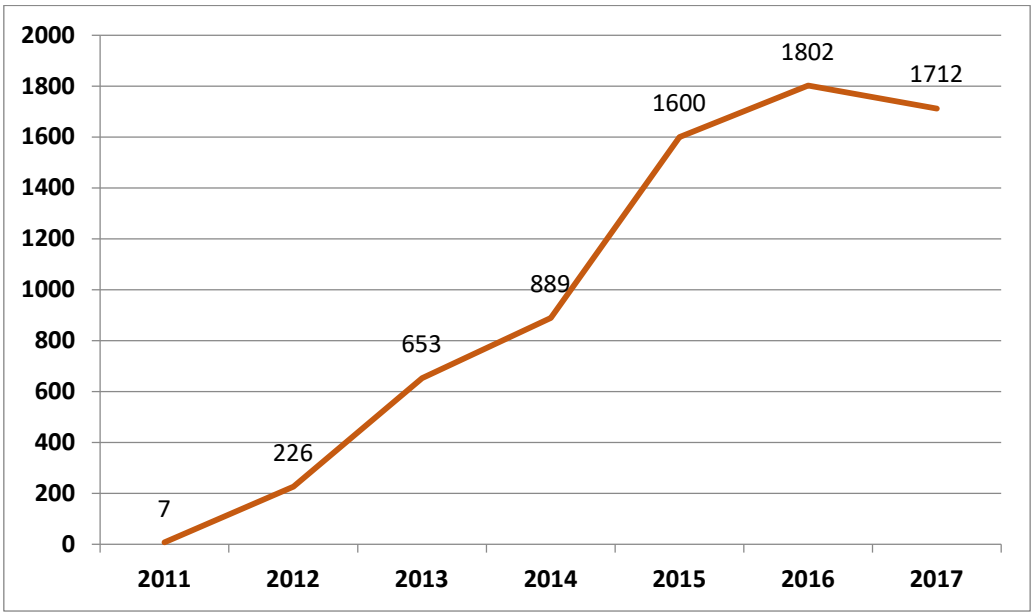


Figure 1. Number of studies on FC model in EBSCO Host databases by year.

When the distribution in Figure 1 is examined by year, it is seen that use of FC model has increased since 2011. In the light of these data, it could be stated that FC model is a research topic worth investigating for researcher; that its area of use has become increasingly widespread; and that its use will gradually increase in future. In addition, the results of the search in the database of the Thesis Center of Higher Education Council using similar key words revealed that there were two studies conducted on FC Model in 2014, eight in 2015, 14 in 2016 and six in 2017. Among these studies, 22 of them were MA thesis and 8 were PhD thesis. FC model, which has started to be used increasingly in Turkey, has been integrated by MEF University, the leading educational institution in this field, to its undergraduate and associate degree programs as appropriate to Bloom Taxonomy (MEF, 2018).

The FC model, which has occurred as an alternative to traditional learning environments, is now applied in Turkey and in the world to help students achieve more permanent and effective learning by increasing the number of in-class activities in the learning process. Accordingly, the basic purpose of the present compilation study was to reveal how the FC model is integrated into learning processes, which areas the studies carried out with this model cover mostly and what benefits and limitations the model has. In the end, various suggestions were put forward for researchers.

2. FC MODEL AND APPLICATIONS

According to related literature, FC model was first applied in the field of chemistry in 2007 by Jonathon Bergman and Aaron Sams. However, Guan (2013) stated that FC model already existed in 1990s; that the model was applied by Eric Mazur as reading activities at home due to lack of the necessary technological sub-structure; that FC model basically requires teachers to prepare course-related videos in advance, requires learners to watch these videos at their out-of-class time to prepare for the lessons (Bergmann and Sams, 2012; Bristol, 2014).

Different from the traditional teaching method, FC model allows students to learn the theoretical part of the lessons via such multimedia tools as online videos, presentations and learning management systems in out-of-class environment. Also, learners undertake the responsibility of individual learning by doing the necessary research on the content besides the related course materials given by the teacher. In class environment, students have the opportunity to share and reinforce their knowledge that they have acquired via related applications and discussion environments. In this process, the teacher takes an active role to help learners (Seaman and Gaines, 2013). Tucker (2012) points out that there is no single way for the application of FC model and that the general method of the application of the model includes sharing the video-recorded content with students at out-of-class time and carrying out the lesson-related applications under the guidance of the teacher in class.

When the studies on FC model in related literature are examined, it is seen that there is an increase in the number of these studies by year and that one of the most important reason for this increase is the influence of use of educational social network sites-social learning network (SLN) in the field of education. Among these network sites, the most common ones include Edmodo, Ning, Elgg and ValuePulse (Dere and Yalçınalp, 2016). In relation to the benefits of use of educational social network sites in education, Thongmak (2013) points out that these network sites allow a new way of interaction between teachers and students, increase out-of-class interaction between students, facilitate cooperation in group projects and allow students to spend time with their peers in a more active learning environment and to share their lesson notes and various other digital sources with each other.

When studies in related literature on FC model are examined, it is seen that the model has been applied in Turkey in such a lot of disciplines as teaching foreign language teaching (Boyraz, 2014), teaching scientific ethics (Urfa and Durak, 2017), teaching scientific research methods (Sırakaya, 2015), teaching the course of material design in education (Aydın, 2016), teaching medicine (Kara, 2016) and teaching computer courses (Doğan, 2015) and that studies mostly tried to measure variables such as learners' views, their academic achievement, motivation, attitudes and satisfaction. In addition, in international literature, there are studies examining learners' academic achievement (Kong, 2014), their participation (Chen, Wang, Kinshuk and Chen, 2014) and their motivation (Abeysekera and Dawson, 2015). It is also seen that researchers mostly applied Bergman and Sams' GC model (2012) in laboratory courses and in mathematical courses as appropriate to the purpose (Strayer, 2012; Bishop and Vergeler, 2013; Davies, Dean and Ball, 2013; Talley and Scherer, 2013; Wilson, 2013; Baepler, Walker and Driessen, 2014).

In one study carried out on FC model, Aydın and Demirer (2017) conducted content analysis and found that the model was mostly applied in the fields of mathematics, mixed disciplines, foreign language teaching and engineering. In relation to the application of the model, the researchers reported that the sources were mostly reached via video-sharing sites (YouTube); that the content was mostly prepared in the form of presentation and videos; that the course

content was shared with students via such platforms as Blackboard, Google docs and Moodle; and that exam-related applications (quizzes) were most popular.

2.1. Benefits of FC Model

In traditional learning environment, learning occurs in a certain period of time in class, while in FC model, more in-class activities and applications are carried out by transferring learning to out-of-class environment, which allows learners to participate more in an active learning environment. In literature, there are a number of studies supporting this view (Tuncer and Taşpınar, 2007; Şenkal and Dinçer, 2012; Çığlık and Bayrak, 2015; Filiz and Kurt, 2015). In addition, the biggest advantage of FC model is that it provides students with the opportunity to learn via learning tools appropriate to their own pace of learning independently of time and place (Bergmann and Sams, 2012; Davies et.al., 2013). Also, when studies in related literature are examined, it could be stated that FC model decreases students' levels of anxiety (Marlowe, 2012) and increases their competencies in cooperative working (Strayer, 2012).

In one study, Turan and Göktaş (2015) reported learners' views about this method as follows: (1) providing more practical opportunities, (2) increasing permanency of learning and (3) allowing revising the lessons repeatedly. Gençer, Gürbulak and Adıgüzel (2014) mention the benefits of FC model for teachers saying that the model encourages teachers to be in the position of a guide in class, to help students more, to work with students on one-on-one basis and in small groups, to save class time and to develop their communication with students. In addition, the researchers reported the benefits of the model for students saying that the model not only provides parents with the opportunity to monitor their children's education process but also allows students to learn in line with their own pace of learning, to develop their self-expression capabilities, to learn about the course content in advance, to follow the lesson subjects even without attending class, to take responsibilities in their individual learning activities and to work on in-class activities actively with their peers (Gençer, et.al., 2014). In studies involving use of cooperative learning in in-class applications, it was found that students taking education with FC model worked more cooperatively (Toto and Nguyen, 2009; Demski, 2012; Strayer, 2012; Butt, 2014; Hawks, 2014; Doğan, 2015). Also, in many studies (Strayer, 2012; Enfield, 2013; Hurley, 2014; Larson, Stephen and Yamamoto, 2013; Hung, 2015; Yavuz, 2016), it was revealed that FC model encouraged students to take more active part in in-class applications and activities.

In FC model, learning does not occur only in class environment. Learners are expected to take more active role in their own learning and to take more responsibility for their learning. In this process, teachers take the role of a coordinator who organizes in-class activities and who arranges the learning materials when necessary (Boyraz, 2014). Ocak (2013) points out that FC model saves learners from the monotony of the traditional model and allows revising the course content repeatedly independently of time and place. According to Sırakaya (2015), use of FC model increases student-teacher and student-student interactions, involves parents in the learning process and allows them to monitor their children, provides a transparent learning

environment, helps learners to learn in accordance with their own pace of learning, allows more effective use of in-class time, increases learners' participation in class, helps them acquire the ability to work cooperatively, provides them with the opportunity to follow the class applications in cases of failure to attend class and allows revising the course content repeatedly in any place at any time. Many studies in related literature reported similar results regarding the benefits of FC model (Bergmann and Sams, 2012; Enfield, 2013; Ocak, 2013; Morgan, 2014; Turan and Göktaş, 2015). In addition, FC model is reported to decrease learners' anxiety (Marlowe, 2012) and to develop cooperative working skills (Strayer, 2012).

2.2. Limitations of FC Model

In related literature, there are several studies mentioning the negative aspects of FC model besides its benefits for teachers and students. The biggest disadvantage of FC model is reported to be the difficulty experienced by teachers in determining whether their students have watched the videos and whether they have learned the lesson subjects or not (Bergman and Sams, 2012; Jenkins, 2017). Gençer and colleagues (2014) stated that students are likely to experience difficulty in their process of individual learning while doing the out-of-class learning activities if they do not interact with their teacher or peers. In addition, it was reporeted that students can not ask questions to anyone about the lesson subjects they have not understood; that they may experience problems when they fail to establish semantic relationships (anlam ilişkisi?) between the lesson subjects taught; and that they eventually miss some parts related to the course content in their learning process.

Miller (2012) states that any decrease in the effectiveness of learning while using FC model is likely to be caused by failure to prepare the learning tool in a way to meet the needs, by students' failure to become active in understanding the lesson subject and by failure to create a learning environment which will allow students to speak and which will help measure their reactions.

Another disadvantage of FC model is reported to be the time to be spent on dealing with students' failure to learn the lesson subject correctly and efficiently. In one study, Turan and Göktaş (2015) reported students' negative views about FC model as follows: (1) lack of technical tools, (2) requiring more time than usual and (3) requirement to watch lesson videos in advance. Gençer and colleagues (2014) mentioned certain negative aspects of FC model saying that it takes time to prepare educational videos and that the application of the model requires technical equipment and thus loads extra burden on the teacher. The researchers also pointed out that teachers' lack of interest, desire and motivation in technology use is likely to be one of the problems to be experienced in relation to the spread of FC model.

3. CONCLUSION AND SUGGESTIONS

When the related literature on FC model is examined, it is seen that the model increases academic achievement in several courses and that learners are satisfied with the model (Başal,

2012; Pierce and Fox, 2012; Bishop and Vergeler, 2013; Enfield, 2013; Findlay and Mombourquette, 2014; Kong, 2014; Boyraz, 2014; Gençer, 2015; Sırakaya, 2015; Turan, 2015; Aydın, 2016). In addition, most studies also demonstrate that blended learning environments increase learners' motivation (Sırakaya, 2015; Chao, Chen and Chuang, 2015). Accordingly, it could be stated that FC model provides active learning environments and allows learners to access learning sources at any time and to progress in line with their own pace of learning and that the model is an important factor increasing learners' motivation. Also, there are some negative views about FC model in term of the fact that the model requires a certain level of readiness and technical knowledge and skills to prepare videos; that it is difficult to determine whether learners have watched the videos or not; and that application of the model takes time (Bristol, 2014).

In literature, it is also reported in relation to use of FC model that learners mostly prefer to learn via videos while using the model (Ekren and Akkul, 2013; Urfa and Durak, 2017); that videos are short in length (Kenna, 2014; Stifle, 2014) in a way to summarize the lesson subject (Torkelson, 2012); and that videos mostly lack motivating factors (Turan and Göktaş, 2015; Serçemeli, 2016). In addition, it could be stated that use of mobile learning tools in the application process of FC model could lead to better learning outcomes (Torun and Dargut, 2015). In related literature, it is pointed out that use of SLN besides mobile learning tools will have positive influence on the learning process (Durak, Çankaya and Yünkül, 2014; Sucu, Akbay and Akbulut, 2015; Dere and Yalçınalp, 2016; Durak, 2017). Lastly, it should be remembered that the knowledge level and the age group of the target population should be taken into account while preparing the educational materials to be used in the application of FC model (Sever, 2014).

Consequently, the necessary sub-structure should be established in educational institutions for the spread of FC model by informing teachers about the model, by investigating the areas in which the model can be effectively used, and by determining the learning outcomes clearly (Gençer et.al., 2014; Urfa and Durak, 2017).

Ters Yüz Sınıf Modeli ve Uygulanmasına Yönelik Öneriler

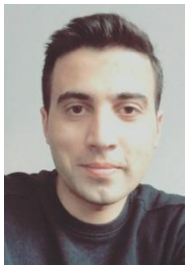
Özet

Bilgi ve iletişim teknolojilerindeki yaşanan hızlı değişimler öğrenen beklentilerini artırmış ve böylece araştırmacıları yeni ve etkili öğrenme yolları aramaya sürüklemiştir. Bu doğrultuda geleneksel öğrenme modellerinin yararlı yönleri ile uzaktan eğitimin yararlı yönlerinin beraber kullanılmasıyla harmanlanmış öğrenme modelleri kullanılmaya başlanmış ve benimsenmiştir. Harmanlanmış modellerden biri olan ters yüz sınıf modeli son yıllarda bu konuda adından sıkça söz ettirmeye başlamıştır. Kısaca ev ödevleri ile ders anlatımının yer değiştirdiği bu model ile alanyazında birçok çalışma yapılmış ve çeşitli değişkenler açısından modelin uygulanabilirliği değerlendirilmiştir. Bu çalışmanın amacı, ülkemizde ve dünyada kullanımı giderek artan ters yüz sınıf modelinin uygulanmasını, uygulama alanlarını, etkili bir ters yüz sınıf modeli uygulamasında gereken bileşenlerin neler olduğunu ve modelin yararlarıyla beraber modeli uygularken yaşanabilecek sıkıntıları sunmaktır.

Anahtar Kelimeler: Harmanlanmış öğrenme, ters yüz sınıf modeli, iletişim teknolojileri

About the Author(s)

Mehmet URFA



Mehmet URFA had his bachelor's degree in Computer Education and Instructional Technology from Marmara University in 2012, and master's degree in Computer Education and Instructional Technology from the Balıkesir University in 2017. He is currently a lecturer at the National Defense University, Army NCO Vocational College. His research interests are online learning, distance education, web programming and mobile programming.

Mailing Address: Kara Astsubay Meslek Yüksek Okulu, Altıeylül, Balıkesir, Turkey 10100
GSM : +90 541 669 18 63
E-mail : mehmeturfa01@gmail.com

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VoScreen Online Foreign Language Learning Environment

Ufuk TAYLAN [a]

[a] *Ministry of National Education, Turkey.*

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Abstract

Foreign language education in our schools has not increased the foreign language level of the students. We can enhance the foreign language levels of the students by providing them with the tools for teaching foreign languages and using them outside of the school. In this study, VoScreen web and mobile application, which is applied in order to develop foreign language listening skill has been introduced. VoScreen provides a new approach to foreign language teaching for making foreign language teaching interesting. The VoScreen application, which consists of short videos, can help students to improve listening skills. VoScreen offers a ranking system based on score which constitutes a sense of competition among students. VoScreen can help students to develop their attitudes towards foreign language courses in a positive way and help students to reach foreign language levels to the intended/ aimed level.

Keywords: VoScreen, foreign language education, web 2.0 technology, English teaching, video education

1. INTRODUCTION

In international community, one of the aims of European Union (EU) countries and the countries which are candidates for EU is to teach one foreign language to individuals at least (The Council of Higher Education, February 2007). For such a significant issue, it has been seen that students in our country do not have enough communication skills in English, even though they have to take English courses since primary school (Paker, 2012). Paker notes that this is because English language education in schools is composed of linguistic subjects and that speaking and listening activities are not carried out for developing communication in English. Speaking and listening exercises are done but not evaluated whereas grammar-oriented lessons decrease students' interest in English language teaching (Paker, 2012).

Another crucial problem in foreign language education in the schools is to giving language courses for the university or high school placement exams (Demirpolat, 2015). Since the aim of language education for exams is to be able to solve multiple choice questions, the significance of improving speaking and listening skills of the students is not seen as important as exams. In the study of Demirpolat (2015), the reasons behind the problematic points of English education in Turkey have been claimed that students have been destitute of individualized education due to the crowded classrooms, foreign language education is formed just for the exams, materials for foreign language education consist of only the course books.

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If it is aimed to educate generations that can understand and speak foreign languages in our education system, we need to benefit from the technologies we use in every field of the life. It has been known that receiving computer aided education creates an individualized learning environment for students and motivates them (Lee, 2000).

Along with all these developments, examples of web applications have started to appear in foreign language education. One of them, VoScreen aims to improve the pronunciation and listening skills of the users by processing foreign language education with videos. It has been revealed that watching movies in foreign language education has many positive benefits such as increasing the motivation in language education and improving the vocabulary (İşcan, 2011). In Ömer Antalyalı's study which was carried out in 2015-2016 academic year of Süleyman Demirel University, it has been aimed to answer the question: "Does VoScreen accelerate learning in English learning?" (Antalyalı, 2016). It has been shown that the students who exceed the 2000 video question threshold, which is the target video question threshold, have had significant improvements (Antalya, 2016).

In this study, it has been aimed to introduce the results of the literature review in which VOScreen as a web application which can be used in foreign language education, basic features and how teachers utilize it, as well as positive effects the applications like VOSCREEN on foreign language education.

2. THE LITERATURE REVIEW

These studies have focused on a few applications, as long as we look at the studies on user-interactive applications in foreign language education. Duolingo as one of these applications, asks selected foreign words for their users in the form of text and audio. The users respond to these questions and gain scores and achievements. Busuu is another application that is subject to research. The Busuu application allows users to match and chat with speakers who can speak the language that they choose to learn.

Garcia, in a research study on Duolingo which is one of the mobile applications used in foreign language education, has introduced that interpretation may be an important contribution to the foreign language education (Garcia, 2013). In another study on Duolingo, Dualingo was applied on 386 people (Vesselinov & Grego, 2012). In this study, a preliminary evaluation was made with Dualingo before the foreign language education. Participants were given a final assessment after the training given by Dualingo and a positive effect of the Dualingo application on the foreign language education was determined with 91.4 points difference between the preliminary evaluation and the final evaluation. Participants pointed out that the application has developed foreign language education and made foreign language education more enjoyable.

In a study on Busuu, one of the interactive applications used in foreign language education, foreign language education was applied on 196 participants via Busuu. Participants were

assessed pre-implementation, at certain intervals during making practice and at the end of activity. Busuu application found that 84% of participants had an important contribution to improve foreign language education (Vesselinov & Grego, 2016). Busuu application has allowed 74% of participants to improve at least one level of their foreign language speaking skills. A 12-point increase in foreign language skills has been achieved. Participants pointed out that Busuu application at the end of the course has affected foreign language education positively and that the app has made education entertaining.

3. VoSCREEN

VoScreen is a web and mobile application utilized in foreign language education. VoScreen has been developed to make up the deficiency of listening and pronunciation elements in foreign language education. In “Reimagine Education 2016” competition which was organized by world-renowned Wharton Business School, UPENN (USA) there were more than 500 global initiative. In this competition, Voscreen developed in Turkey was chosen as the third in "Best Education Application" category. At worldwide, the number of users has exceeded 1.7 million and has been used in 74 countries. Students can sign in the app via their Facebook accounts on the system and create new users with their e-mail accounts (Figure 1).

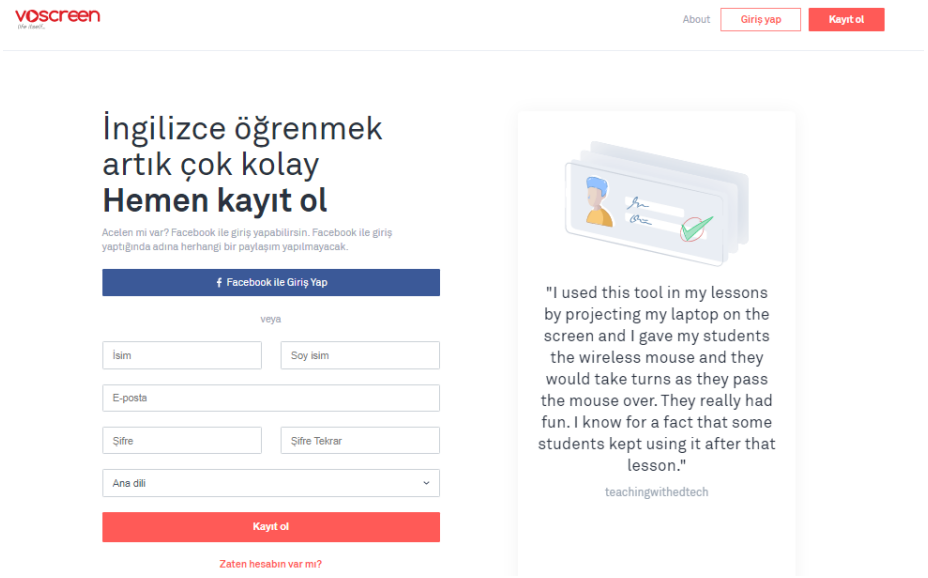

Figure 1. VoScreen Registration Screen

The language education that begins with the videos of a category which is selected by the students consists of question about the videos (Figure 2). The videos are up to 15 seconds long and are composed of contents such as various series, movies and advertisements. At the final part of the videos, the dialogue in English has been asked for finding out by choosing the correct one among the wrong answers. Every correct answer has been graded. Every wrong answer drops the total score. To answer the questions, the duration has been given according to the length of the videos. The correct answer of the unanswered questions has been displayed on the screen and the question has been incorrectly answered has been recorded as wrong answer in the system. Thanks to the scored points, it creates a sense of competition in

practice by ranking the people who use the application all over the world. The users can see in detail what questions they answer, how many days they have practice, how many questions are correct and how many are wrong, and in which categories the questions are.

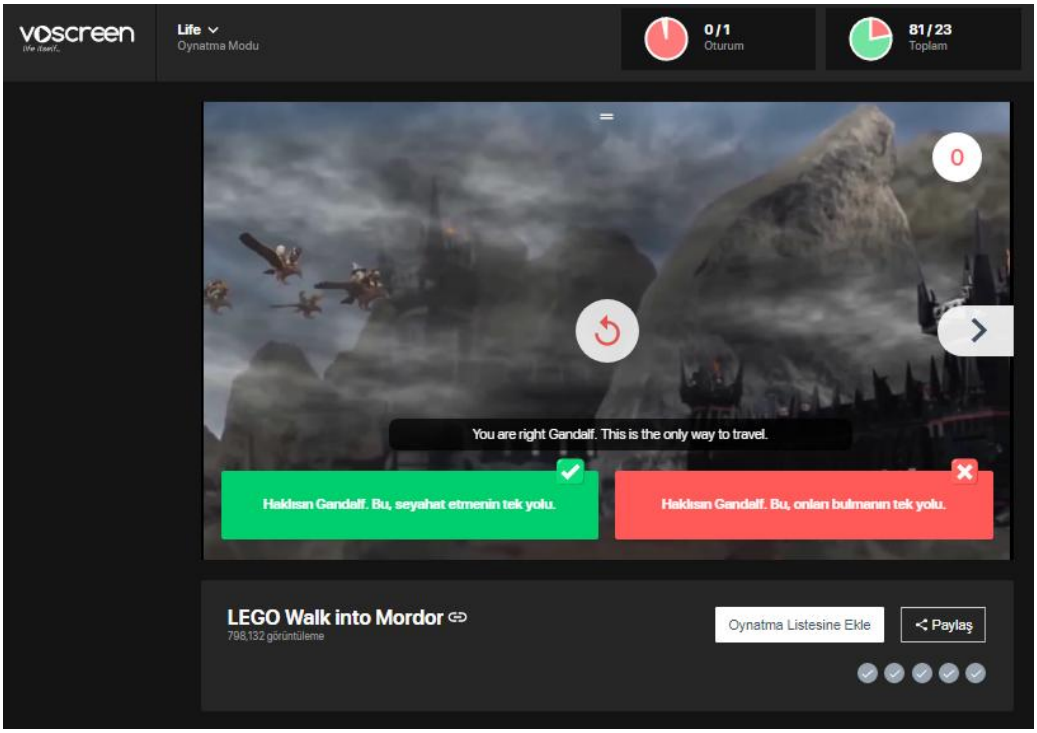

Figure 2. VoScreen Home Screen

Questions about videos on VoScreen are grouped in categories (Figure 3). From these categories, VoScreen Life consists of questions about dialogues of videos about daily life. The voKido category consists of videos which are prepared for the children. This category has three color categories as Red (Red), Yellow (Yellow) and Green (Green). In the main category, VoStep; there are videos which are made with considering the levels determined in foreign language courses. Under the VoStep main category, there are sub categories such as Beginner, Elementary, Intermediate, Upper and Advanced. In each subcategory, there are appropriate questions about the videos at that level. Under one of the main categories, voRhytm, there are subcategories which have been prepared with regarding the age groups. There are 1-3, 4-6, 7-9, 10-12, 13+ categories in voRhytm and there are appropriate questions about videos for each age group. In vOStructure, there are appropriate question about videos for grammar of English language. In VoStructure, subcategories have been formed with consisting of grammar subjects such as Am-Is-Are, Can, Will etc. and there are appropriate questions about videos for each subject in each grammar category.

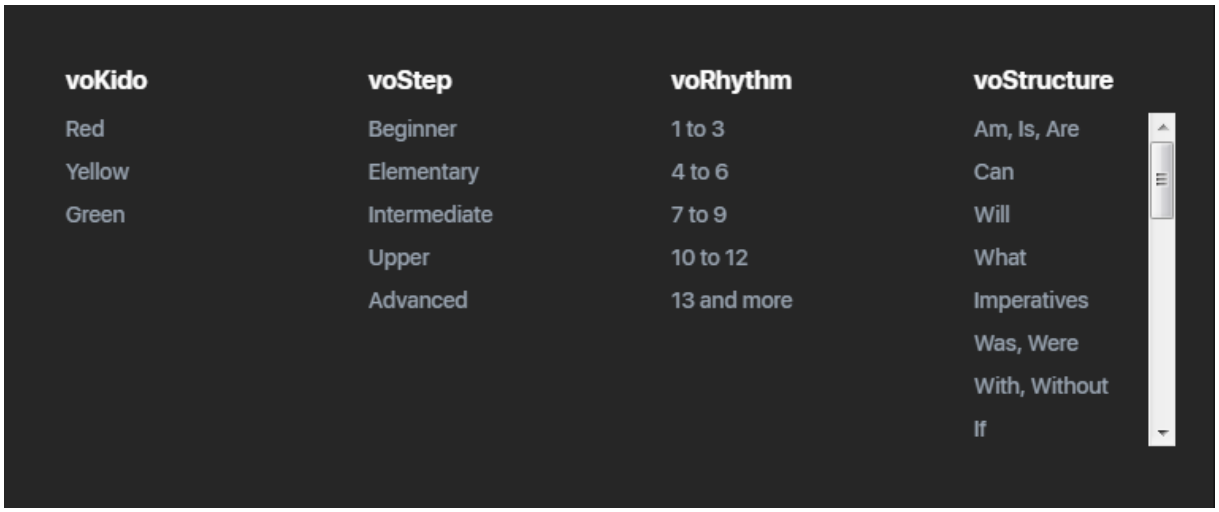

Figure 3. Categories

VoScreen for Trainers

Trainers can create classes by their own accounts. After creating the class, the system allows the trainer to take an address for registration. After the trainer shares this address with the students, the students can register to the class by their own accounts. Trainers can create more than one class (Figure 4).

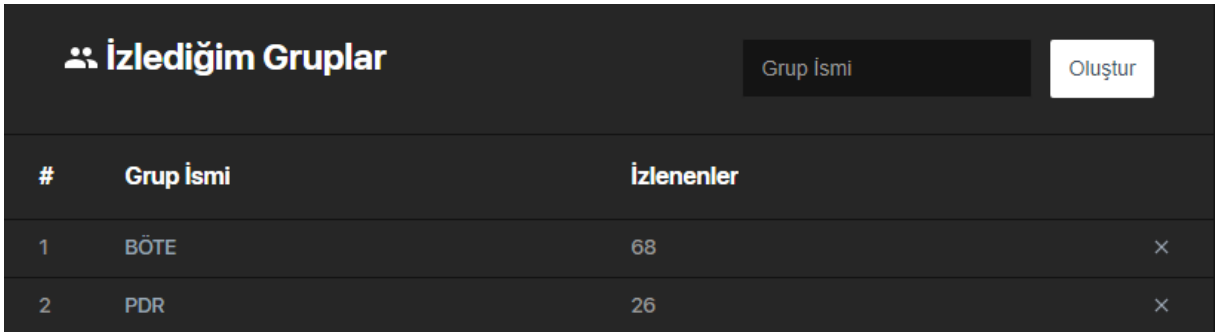

Figure 4. Viewed Groups

Students can see points that each of them scored in the class and grading list by looking at the classes they were enrolled in the system (Figure 5). They can follow up with detailed statistics on which days, which categories, how many students gave correct answer and how many of them are wrong (Figure 6). Competition environment has been emerged among the students.

İzlenen	Başarılı	Başarısız	Puan	
Zülal Destancı	56	27	-119	×
Halil İbrahim KUYUMCU	41	22	-103	×
sedef altunakar	4	4	-61	×
Oktay ACAR	0	0	0	×
ogün özkan	3	1	12	×
İbrahim Karcı	8	2	29	×
Mehmet Yılmaz	109	63	60	×
Tuba Aslan	11	4	76	×
Z Krkmz	44	16	101	×
alime gül şahin	31	9	179	×
Sedanur Özenç	160	53	182	×
Orhan Kaya	82	32	224	×
Sevilay Karaca	99	43	226	×
Tuğba Türk	256	123	501	×
Dilek Pekbay	149	33	687	×
Cemile Aslan	158	23	731	×
Esma Tatarca	155	30	844	×
İREM SAVRAN	152	25	921	×
FADİME AYDOĞDU	308	75	1011	×

Figure 5. Statistics Screen of a Group Viewed

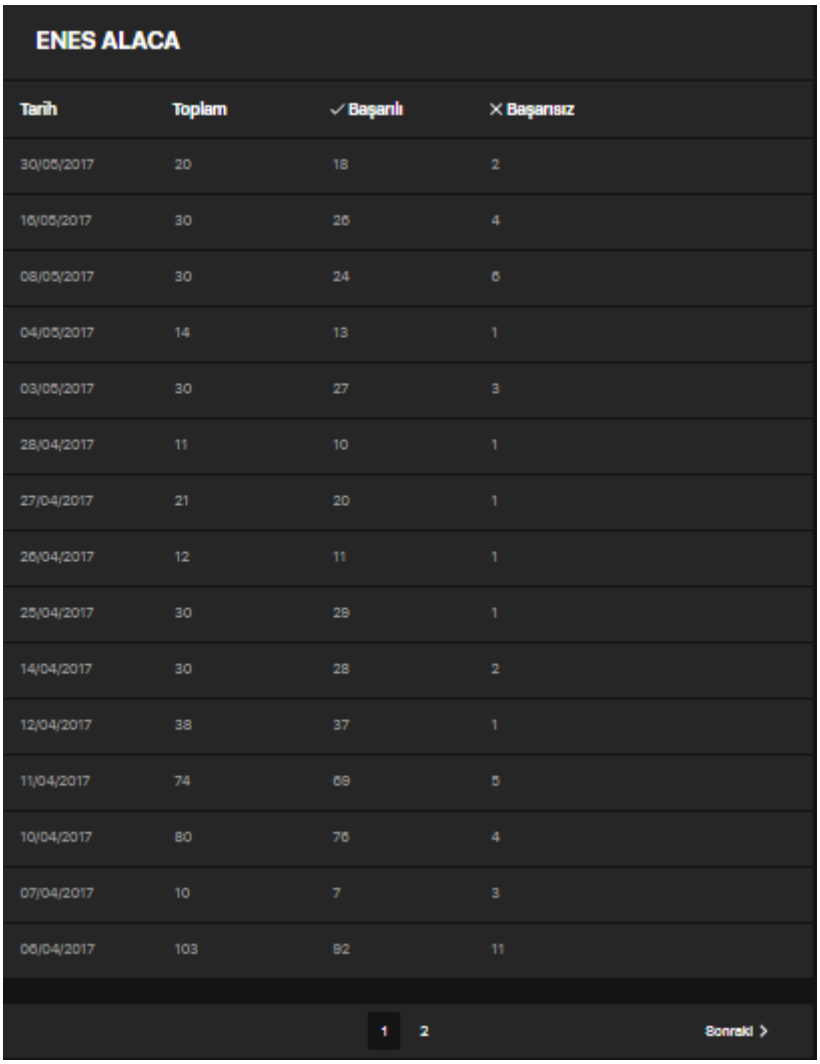

Figure 6. Statistics Screen of a Viewed Individual

Since VoScreen consists of short video segments, it is a potentially interesting application to appeal the students. It has been aimed to create an interesting atmosphere for the students when they see a section from a movie they have watched before. It has been trying to draw attention to what spoken text is, how it is pronounced and what it means. In this regard, foreign language education can provide an environment in which students are far away from monotony and more active.

Trainers can apply this practice to measure and evaluate the attention of the students as well as drawing their attention to the course. They can learn by means of feedbacks with asking the number of questions they have answered and whether a topic has been understood or not according to their true-false rates. The level of the students can be followed regularly, and the efficiency of the courses can be measured.

4. CONCLUSION AND RECOMMENDATIONS

In this study, the basic features of VoScreen and explanations which clarify how teachers can use it have been mentioned. Watching movies and videos in English can improve listening

and pronunciation skills in foreign language education as these activities clearly show us the usage of that language in everyday life. Moreover, such resources on the internet, which enrich the teaching environments in foreign language education, improve the quality of education by increasing the interest in foreign language education (Karal & Berigel, 2006).

In the classrooms, teachers write vocabulary texts and give theoretically course, and after asking questions about video related to the course subject via VoScreen, thus students can both enhance their listening skills and do the course subject over. Since videos can catch the attention of student, they may be more interested in the course and willing to learn. VoScreen creates a competition environment among the students; it can also increase the enthusiasm of them for the courses. VoScreen can be applied both in the classroom and outside of the school for bolstering foreign language courses. Utilizing internet-based learning environments in foreign language education will positively affect both students' attitudes towards foreign language education and their success in foreign language education (Karal & Berigel, 2006).

When all these advantages of VoScreen are considered, various recommendations have been introduced below:

- It has been recommended that foreign language teachers apply VoScreen in their lessons.
- It has been recommended that VoScreen be applied as an evaluation tool at the end of the courses of the school’s curriculum.

VoScreen Çevrimiçi Yabancı Dil Öğrenme Ortamı

Özet

Okullarımızda verilen yabancı dil eğitimi öğrencilerin yabancı dil seviyesini istenen düzeye ulaştıramamaktadır. Yabancı dil eğitimine yardımcı araçları derslerde ve okul dışında kullanılmasını sağlayarak öğrencilerin yabancı dil seviyelerini yukarıya taşıyabiliriz. Bu çalışmada yabancı dil dinleme becerisinin geliştirilmesi için kullanılan VoScreen web ve mobil uygulaması tanıtılmıştır. VoScreen yabancı dil eğitimine yeni bir yaklaşım getirerek yabancı dil eğitiminin ilgi çekici olmasını sağlamaktadır. Kısa videolardan oluşan VoScreen uygulaması öğrencilerin dinleme becerilerini geliştirmede yardımcı olabilir. VoScreen puana dayalı bir sıralama sistemi oluşturarak öğrencilerde yarışma hissi oluşturmaktadır. VoScreen öğrencilerin yabancı dil derslerine olan tutumlarını olumlu yönde geliştirmelerini sağlayabilir ve öğrencilerin yabancı dil seviyelerini istenen düzeye ulaştırmakta yardımcı olabilir.

Anahtar Kelimeler: Voscreen, yabancı dil eğitimi, web 2.0 teknolojisi, İngilizce öğretimi, video eğitim

About the Author(s)

Ufuk Taylan

Ufuk Taylan has got bachelor's degree (BS) from Balıkesir University, Department of Computer and Instructional Technologies Teacher Education in 2015. He has been continuing his academic life as a graduate student in Balıkesir University, Department of Computer and Instructional Technologies Teacher Education while he is working as a Computer and Instructional Technology Teacher in Ministry of National Education. His interest areas are robot software, gaming software and studies on usage of technological tools for education.

Mailing Address: Balıkesir Üniversitesi, Necatibey Eğitim Fakültesi, Bilgisayar ve Öğretim Teknolojileri, Balıkesir, Turkey, 10100
Mobile: +90 546 738 4793
e-mail: ufuktaylan10@gmail.com

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