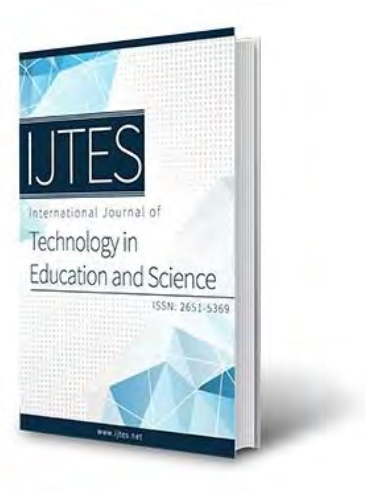

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Abstract

With the development of Web 2.0 technologies, the studies conducted in this field are diversifying and quite different results are obtained. In the current study, the contributions of wikis and blogs, which are considered as web 2.0 technologies, to academic performance were examined with meta-analysis method. The studies following quasi-experimental approach and have a control group with pretest-posttest measures published both in Turkish and English are included in the study. In consideration of the criteria determined, 19 studies were selected to be considered for the current study. The studies having participants from nine different countries were coded, and then they were analyzed in a meta-analysis software called CMA. As the distribution of data was heterogeneous, a random effects model was selected and the analysis was performed. Effect size (E++) according to the analysis performed by the Hedge"s g value and 95% confidence interval was found as 0.740. Results show that the impact of web 2.0 technologies on academic performance is positive and moderate.

Introduction

Innovations in the internet technology have been utilized in the world of education in a widespread and diverse manner. The Internet applications help learners to interact with each other directly, economically, and easily without any time and space limitations (Warschauer, 1996). Web 2.0 technologies change the way that people use the web and services it provides (Weller, 2007). Learning environments, also called Web 2.0, confront us as the environment designed to provide an effective use of the opportunities offered by the Internet in education. The main factor differentiating web 2.0 technologies from other web technologies is that users become an active participant of content creation process in their learning experience. Thus, users can collaborate and interact with each other, contribute to the content, make changes on the website in line with their own use, and share their thoughts at any time (Franklin & van Harmelen, 2007; Heafner & Friedman, 2008). The reason for the attractiveness of web 2.0 environments in education is that it facilitates the learners to read, write, think, and reflect during the learning activities. In addition, since learners can easily master about creating content or web pages without having to learn coding knowledge, utilization of such environments becomes widespread in educational and daily contexts. Therefore, web 2.0 technologies have become a part of the daily and academic life of many students (McBride, 2009).

When the studies on the effects of blogs and wikis on academic achievement are examined, it is seen that various results are obtained. A more detailed analysis should be made to reach a reliable conclusion from the information formed by the studies. Thus, data related to previous studies can be effectively used, interpreted, and new studies can be directed. In addition, when the studies on the contribution of wikis and blogs to student educational outcomes are reviewed, it is seen that review studies examining past research data and results are limited. One of these studies examines the contribution of wikis to collaborative writing processes (Stoddart, Chan & Liu, 2016). Another study by Sim and Hew (2010) is a review study that covers experimental studies examining the effects of blogs on higher education context. However, when studies on the contributions of blogs and wikis to academic success over the past decade are examined, it is seen that there are no review studies in which many studies are examined together. Moreover, there is no study on this subject that aims to reach a conclusion by analyzing only studies in experimental nature. Therefore, there is a lack of evidence for whether these technologies contribute to academic achievement. The present study sheds light on the impact of using wiki and blog technologies regarding the academic achievement of students by examining the effect size of experimental studies.

Literature Research

Web 2.0 Learning Environments

Among the most used web 2.0 learning environments, blog, wiki, podcast and social networking can be specified. Based on the studies of Churchill (2011) and Bower, Hedberg, and Kuswara (2010), the web 2.0 classification prepared by Hew and Cheung (2013) is shown in Table 1.

Table 1. Classification and Examples of the Web 2.0 Technologies

Characteristic	Technology	Sample	Synchronization
Online reflection	Weblog	Blogger, Edublogs	Asynchronous
Online collaboration	Wiki	Pbwiki, Wetpaint	Asynchronous
	Audible discussion board	Wimbavoice, Voicethread	Asynchronous
Social areas	Social networks	Facebook, Twitter	Synchronous
Storage	Video sharing	YouTube	Asynchronous
	Podcast	Houndbite, Chirbit	Asynchronous
Social bookmark	Social bookmark	Delicious, Diigo, Simpy	Asynchronous
Three dimensional virtual worlds	Game virtual worlds, social virtual worlds	World of Warcraft, Second Life, Active Worlds	Synchronous

The utilization rates and utilization patterns of these environments may vary according to the various course areas. For example, it is specified that the blogs are effective in terms of the development of writing and discussion skills (Downes, 2004). Blogs conveying individual experiences are seen as the tools that support reflective thinking (Li et al., 2013; Yang, 2009). Wikis, as another web 2.0 environment, help the students to add, delete, or edit content in web pages collaboratively with other students. It offers opportunity to create

flexible and updateable content. For this reason, wikis are mostly used in groups where the students work on collaborative class or writing projects (Leuf & Cunningham, 2001). Richardson (2006) puts forward the educational returns of Wiki, blog, podcast, and other web 2.0 tools as;

- Strengthening critical, analytical, creative, intuitive, and relational thinking.
- Providing easier access to qualified information.
- Enabling the combination of individual and social interaction.

Studies examining the impacts of Web 2.0 learning environments on students with different schooling levels are becoming increasingly prevalent. However, no study that gathers these studies under the same roof to see the general effect and trend is found. The aim of the current study is to determine the effects of wikis and blogs on the academic performance of the students.

Blogs

Blogs can be briefly defined as online personal journals (Zawilinski, 2009). Such journals do not only consist of static texts, images, videos, and links, they facilitate the interaction for other users. For example, the comments written under the texts by other users allow to share appreciation, criticism, and any other contribution to the text. Duffy and Bruns (2006) explained the components in the blogs as the date of publication, labeling of the category of the publication, the title, the main content, links from other sites, comments, persistent links, and as the footnote section under the relevant publication including the publication date, author, category, number of reads, and the number of comments. When the studies about use of blogs for educational purposes are examined, many of them indicating that they have positive contributions on learning. Blogs are found to be useful in terms of documenting the learned information, sharing experiences and knowledge with the peers far away (Lin et al., 2006), information management (Yang, 2008), facilitating teacher-student and student-student interaction (Ding, 2008), in-class communication (Coulter and Draper, 2006; Pimpare and Fast, 2008), improving critical thinking skills, social skills, and motivation for learning (Krause, 2005).

Contribution of Blogs to Academic Performance

Many studies assert that the blogs have positive impact on academic performance. When the studies in the literature are examined, it is observed that effects of writing blogs were examined especially in foreign language education. It is specified that writing blogs in a foreign language such as English has positive contributions in the writing performance (Arslan and Kızıl, 2010; Koçoğlu, 2009; Şimşek, 2010) and in the reading performance (Fattah, 2016; Hsu and Wang, 2010; Yakut and Aydın, 2017). In addition, it is suggested that blogs are effective in the academic performance of science education (Chuang and Shen, 2008).

Koçoğlu (2009) worked with 24 first-year pre-service English teachers at a private university. Twelve students in the experimental group used blogs outside the classroom. As a result, the blog was found to be effective in developing English writing skills. In addition, the students in the experimental group reported that they found the use of blogs as entertaining and creative. Arslan and Kızıl (2010) studied the use of blogs in teaching

English as a foreign language. They worked with 23 students in the control group and 27 students in the experimental group. The results of their analysis showed that the writing performance of the students using blogs was higher than that of the traditional classroom education group.

Şimşek (2010) worked with 70 primary school students to determine the effect of weblog use in the writing performance of the students. Significant improvement was observed in both the experimental and control groups, as the group using weblog was the experimental group. However, the final test results showed that the experimental group was significantly better than the control group. In the quasi-experimental study of Hsu and Wang (2010) including 149 university students, the effects of using blogs were examined to understand on the development of reading level and motivation for learning. The researchers collected and analyzed both quantitative data and qualitative data. They concluded that the use of blogs was highly correlated with students‟ reading achievement. Fattah (2016) included 22 first year students of a private university in Saudi Arabia in his study to examine the contribution of blogs to the reading skills for learning English as a foreign language. The participants were divided in experimental and control groups within each group 11 participants took place. While the experimental group was given the opportunity to read teacher‟s blogs, there was no privilege for the control group. The research, which lasted for two months, showed that reading teacher‟s blog entries was significantly effective on improving reading skills.

Yakut and Aydın (2017) included 42 foreign language education students in their experimental study. Pre-test and post-test were administered to the participants regarding their reading skills. The results showed that teaching reading had a positive effect on the reading performance. However, using only blogs did not guarantee better performance in terms of the reading skills. Chuang and Shen (2008) examined the effect of the information sharing blogs on learning outcomes and student satisfaction. In an experimental study including three groups, one group used an information sharing blog, another group used only blog, and the third group used the traditional classroom environment. The group with the opportunity to share information showed better learning performance and much more satisfaction than other two study groups.

Papastergiou, Gerodimos, and Antoniou (2011) examined the effect of blog use on the knowledge level of the students and ICT self-efficacy in the physical education course. The participants were provided to develop blog entries regarding four specific basketball skills, and to receive comments from their teachers, friends, and other experts as the internet users. The results of the 11-week study with the participation of 70 students showed that the use of blogs was not significantly effective on basketball knowledge.

Some of the experimental studies examining the difference between the users using and not using blogs revealed that there was no significant difference in terms of the academic performance. For example, Anderson (2010) determined that blog writing and creating an electronic journal record did not cause any difference in terms of writing skills. A similar research was conducted by Erickson (2009) and it was stated that writing blogs did not differ in terms of the contribution to performance. In another study conducted using collabortive writing methods, Zhu (2015) found that using blogs did not significantly change the writing performance.

Wikis

Wiki is a web platform that allows users to write, edit, and modify a content piece collaboratively (Richardson and Mancabelli, 2007). Changes made by different users can also be tracked and changes can be undone, if necessary. These processes can be easily implemented through simple text editing interface of wikis, so users are not expected to have extensive knowledge of web programming technologies. Wikis can be designed to be utilized by any web user and they can be restricted to be utilized only by defined users (O'Leary, 2008). Wikis used for education can be given as examples for such. Duffy and Bruns (2006) explained some of the ways in which wikis could be used for education:

- Students can develop research projects while they arrange their studies prepared in the wiki environment.
- Students can prepare a summary of a reading text collaboratively and add notes about their thoughts.
- Wikis can be used to publish course resources such as course schedules and course notes, and students can edit and comment on them so that everyone can see.
- Teachers can use wikis as a knowledge base by enabling the students to share their thoughts and reflections on the teaching practices.
- Wikis can be used to map the concepts. They are useful for brainstorming, and the arrangement of a given wiki topic can create a correlative resource network.
- Wikis can be used as a presentation tool instead of traditional presentation software (PowerPoint, etc.) and students can directly interpret and review the presentation content.
- Wiki is a group writing tool. The group members can be gathered by using wiki, and are provided to create and edit a single document on a single and central wiki page. Thus, equal participation can be achieved.

There are many studies on the use of wikis for educational purposes. Positive results are published in, for example, peer feedback (Wever, Keer, Schellens, & Valcke, 2011), collaborative learning (Ioannou, Brown, &Artino, 2015; Kear, Woodthorpe, Robertson, & Hutchison, 2010;Katzlinger & Herzog, 2014), perception of querying population (Wicks, 2012) and contribution to learning (Alshumaimeri, 2011; Caruso, 2014; Farmer, 2009; Li, Chu, & Wah, 2014; Neumann & Hood, 2009; Ras &Rech, 2009; Ren, Baker, & Zhang, 2009; Thompson & Bryant, 2014). When the studies about the contributions of wikis and blogs to education are examined, it is seen that the positive results are in majority. However, this opinion needs to be supported statistically. The results obtained in the current study are also valuable in terms of revealing the course type and the level of instruction in which empirical studies about wikis and blogs are concentrated.

Contribution of Wikis on Academic Performance

When the literature is reviewed, it can be seen that wikis are frequently used to evaluate the writing performance, as in blogs. Alshumaimeri(2011), Li et al.(2014), Kassem (2017), Liu, Jiao, & Chen, (2016), Zou, Wang, & Xing, (2016) examined wikis in English writing education as a foreign language. In addition, wikis are experimentally examined in statistics (Neumann and Hood, 2009), software (Ras and Rech, 2009), history (Heafner and Friedman, 2008), biostatistics (Fong et al., 2017), computer (Ozdener, 2017), and oral presentation

skills (Awada and Diab, 2018).

Alshumaimeri (2011) has evaluated 42 university students by pretest-posttest using wiki to improve their English writing skills. Although significant improvement was observed in both experimental and control groups; the experimental group was found to be significantly better than the control group in terms of the skills and quality of writing. The implications of the results are that wikis can benefit teachers and students by improving their writing skills in accuracy and quality in a collaborative environment. Li et al. (2014) determined the writing skills of primary school fourth year students by having them write a composition on a platform called Mediawiki. By using a quasi-experimental design, two groups (classes) of Primary Four students participated in this study. The findings of the study revealed that wiki-supported collaborative writing processes have a positive effect on writing proficiency, but this effect does not make a significant difference.

Kassem (2017) worked with 60 university students who are studying English as a foreign language with a quasi-experimental study. The study measured professional writing skills; and the results found a significant difference between the experimental and control groups. These findings revealed the positive effects of wikis on developing business writing skills. Liu, Jiao, & Chen (2016) conducted an experimental study using wiki in the teaching of writing in English based on the theories of cooperative writing, process-based writing, formal evaluation, and peer review. Their study involved 52 students in one middle school in Guangzhou China. The results showed that wikis had a positive effect on the development of English writing skills.

Zou, Wang, & Xing (2016) used wiki within the scope of cooperative roles in an online language exchange program for teaching English as a foreign language. The study was conducted with students studying an English module at an international university, China. Beyond developing the writing skills of the students, wiki has become an environment where they have fun while correcting their language errors. Neumann and Hood (2009) used wiki to test the participation level and report writing skills of students in a statistics course at higher education level. While a group wrote reports individually, other group analyzed the same data set using wiki. As a result, the students using wiki to write reports exhibit higher cognitive engagement and class participation than the individual approach and they interact better with other students.

Ras and Rech (2009) examined the effect of wiki on the knowledge acquisition of software engineering students in preparing their final papers. The students who participated were undergraduate and bachelor students with an average study time in computer science of 3.5 years and an average software development experience of 4.2 years. The results showed that the wiki-supported group had obtained 204% more information than the control group. Heafner and Friedman (2008) examined the short- and long-term effects of the wikis created by the students on student participation and learning. As a result of an eight-month research, it was observed that the wiki-forming group had a larger reminder content than the traditional group that was oriented by the teacher. The long-term cognitive value of the wikis positively impacted student understanding by helping students to link content, both literally and figuratively. Fong et al. (2017) used wiki for determining the cooperative learning, learning approach and the course performance of the university students in the biostatistics course. The wiki was used at a frequency of about 0.7 times per week per student. According to the results, no significant

difference was observed between the groups and it was suggested that the students had similar gains in both groups.

In the experimental study conducted by Özdener (2017) on pre-service elementary school teachers, three study groups were formed as wiki, gamified wiki, and control group to understand the effect of wikis on student academic achievement in the electronic spreadsheet use course. In order to examine the long-term effects of Wiki activities supported by gamification elements on student academic success, a repeated measures analysis of variance (ANOVA) statistical test was conducted based on scores from an initial preknowledge test, an applied interim examination, and a final examination. The results of the electronic table use showed that wiki groups significantly did better than the control group.

Awada and Diab (2018) conducted an experimental study with 81 English as Foreign Language (EFL) learners. Dynamics of Google Earth and wiki were used to provide the students to gain oral presentation skills throughout a 6-week teaching process. The study was conducted with three groups of students as one experimental group for Google Earth, one experimental group for wiki, and a control group. The study resulted in favor of the experimental study groups. It was seen that Wiki and Google Earth group did significantly better than control group on active learning and knowledge acquisition.

The majority of the research results examined within the scope of the study show that blogs improve academic performance (Arslan and Kızıl, 2010; Chuang and Shen, 2008; Fattah, 2016; Hsu and Wang, 2010; Koçoğlu, 2009; Şimşek, 2010; Yakut and Aydın, 2017). In addition, there are research results that determine that the block has no effect on academic performance (Anderson, 2010; Erickson; 2009; Papastergiou, Gerodimos and Antoniou; 2011; Zhu, 2015). The same situation is also valid for wikis. While some research studies conclude that wikis are effective tools to improve academic performance (Alshumaimeri, 2011; Heafner and Friedman, 2008; Kassem, 2017; Liu et. al., 2016; Neumann and Hood, 2009; Özdener, 2017; Ras and Rech, 2009; Zou et. al., 2016;); some research results suggest that wikis have no significant effect on academic performance (Fong et. al., 2017; Li et. al., 2014).

When the review studies are examined, it is seen that they gathered studies that were mainly conducted using survey research approach with single groups. The review studies that analyzed only studies in which pretest-posttest control group approach is utilized in the context of blogs and wikis are very limited. Additionally, available experimental studies in the literature were carried out with limited number of participants. It would be helpful to understand collective effect of blogs and wikis on student performance if all these studies are examined together.

The purpose of this study is to combine the results of independent studies examining the effectiveness of wikis or blogs on academic achievement. With the development of Web 2.0 technologies, the studies conducted in this field are diversifying and vastly different results can be observed. The factors such as the high number of variables examined and use of different analysis methods may cause difficulties in explaining such different results of effectiveness. This demonstrates the need for research to facilitate access to the information and

results sought and to apply the method of collective analysis. For this reason, meta-analysis that is the analysis of the analysis as described by Glass (1976) was applied. In this meta-analysis study, research question aimed to be answered is “Do wikis and blogs have meaningful effects on academic performance?”

Method

The aim of this study is to examine the effect of web 2.0 on academic performance. Thus, the meta-analysis method which provides a general result by combining the results of various studies is preferred. Simply, meta-analysis is a statistical technique combining the study findings that have common research hypotheses (Cooper and Hedges, 1994). Although meta-analysis is a time-consuming method when it is executed regularly, it has become easier to carry out the literature research and meta-analytic processes due to the improvements in calculation and statistical software. In a meta-analysis, the participants or the students are not the analysis units, but the studies themselves are the analysis units. In a meta-analysis, the researcher collects the studies related to a specific area and synthesizes the results of all the studies using codes and statistical methods. The quantitative result of each study is converted to the effect size (Denson & Seltzer, 2011). Glass, McGraw, and Smith (1981) explained the steps of meta-analysis method as follows:

Step 1: Conducting a literature research for determining the studies.

Step 2: Encoding the determined studies according to their properties.

Step 3: Calculating the effect size, which is the general value of the study results.

Step 4: Investigating the relationship between the study characteristics and the study results.

Data Collection

The first step of conducting a meta-analysis is the selection of research studies (Cooper, 1982). This is an important step in terms of the proper representation of a comprehensive research. With the intent of determining the effect of wiki and blog on academic performance, studies on wiki and blog conducted between 2008 and 2018 were examined within the scope of the research. A total of 22,300 search results were obtained by using "effect of wikis on academic performance" and "effect of blogs on academic performance" keywords between the years specified in Google Scholar, the most known academic search engine. The inclusion of all the studies reached through the literature review in meta-analysis may cause erroneous results. In the meta-analysis, some criteria should be selected when collecting the studies. It is important to select the studies with the necessary statistical data in accordance with the analysis (Lipsey and Wilson, 2001). The criteria that are taken into consideration when collecting data related to the current study are as follows:

1. *Web 2.0 type:* The studies that used wiki or blog as a teaching and learning tool are included in the current study.
2. *Database:* Google Scholar, AcademicSearch Complete (Ebscohost), Eric, ScienceDirect, Taylor& Francis Online, SpringerLINK Complete - EKUAL, IEEE Electronic Library Online databases are used while the studies to be selected for the research are being determined. Keywords are as follows:
   - Wiki
   - Blog

- Weblog
- Wiki and Education
- Blog and Education
- Wiki and Education
- Wiki and Education
- Wiki and academic performance
- Blog and academic performance

3. *Language of publication:* The studies evaluated in the research consist of the studies published in Turkish and English.
4. *Period:* The research includes the studies investigating the effect of any of the wiki and blog learning environments on academic performance between the years 2008 and 2018.
5. *Study type:* While determining the studies included in the current study, only the studies in the type of journal articles are taken into the consideration for analysis. The papers published in conferences, symposiums, and dissertations are eliminated from the analysis. Journal articles are generally subject to blind reviewing process. In this process, the referees review the content without knowing the author's identity. This suggests that the type of article has undergone a more objective assessment. In other study types, there is a possibility that the evaluation phase can be more subjective. Therefore, more reliable data can be obtained through journal articles.
6. *Experimental process type:* For the purpose of achieving the standardized effect size, it is required that analyzed studies must have control and experimental groups. The studies included in the current study are designed according to quasi-experimental research design with the pretest-posttest and control group. The final test data is considered when calculating the effect sizes. The studies in which wikis or blogs are used in the experimental group are the scope of the current study. If more than one experimental group is used, in other words, if there are more than two research groups, the final test values between the wiki or the blog group and the control group are compared.
7. *Numerical data (mean, sd, n):* In the studies evaluated, process is performed by the mean, standard deviation, and sample size. In a few studies in which these values are not specified, the t value, F value, and p value that are supported by the CMS software used in the research are used.
8. *Dependent variable:* It is possible to find many studies about the effects of the educational use of Web 2.0 on learning outcomes. In this study, only experimental studies that at least have academic achievement as a dependent variable are examined. In some of the studies selected for this research, there are different expressions instead of academic achievement, for example, learning outcome, learning performance, writing-reading skill, course performance. However, performance test was applied to students and their scores were calculated in all of them. Therefore, the measurement of learning performance with cognitive tests was evaluated as measuring academic achievement.

Among the studies included, there are studies examining the effect of wikis or blogs on multiple outputs. For example, other variables such as anxiety, self-efficacy, attitude, and satisfaction besides the academic achievement, are compared. In the present study, analysis is done only with the data regarding academic achievement. The authors, publication years, and titles of the studies included in the research by searching certain databases are shown in Table 2.

Table 2. Studies Included in the Research

Author	Subject	Year	Title
Şimşek, Ö.	Blog	2010	The Effect of Weblog (blog) students‟ writing performance
Koçoğlu, Z.	Blog	2009	Weblog use in EFL writing class
Chuang, H. M., & Shen, C.C.	Blog	2008	A study on the applications of knowledge-sharing blog concepts to the teaching in elementary school
Alshumaimeri, Y.	Wiki	2011	The effects of wikis on foreign language students writing performance
Li, X., Chu, S. K. W., & Wah, W.	Wiki	2014	The effects of a wiki-based collaborative process writing pedagogy on writing ability and attitudes among upper primary school students in Mainland China
Neumann, D. L., & Hood, M.	Wiki	2009	The effects of using a wiki on student engagement and learning of report writing skills in a university statistics course
Papastergiou, M., Gerodimos, V., & Antoniou, P.	Blog	2011	Multimedia blogging in physical education: Effects on student knowledge and ICT self-efficacy
Arslan, R. Ş., & Şahin-Kızıl, A.	Blog	2010	How can the use of blog software facilitate the writing process of English language learners?
Hsu, H., & Wang, S.	Blog	2010	The impact of using blogs on college students' reading comprehension and learning motivation
Ras, E., & Rech, J.	Wiki	2009	Using wikis to support the Net Generation in improving knowledge acquisition in capstone projects
Heafner, T. L., Friedman, A. M.	Wiki	2008	Wikis and constructivism in secondary social studies: fostering a deeper understanding
Fattah, A.	Blog	2016	The effectiveness of using blogs as an independent learning tool to develop reading skills for university students
Yakut, A.D. & Aydın, S.	Blog	2017	An experimental study on the effects of the use of blogs on EFL reading comprehension
Awada, G. & Diab, H. B.	Wiki	2018	The effect of Google Earth and wiki models on oral presentation skills of university Efl learners
Fong, S. S. M., Chu, S. K. W., & Lau, W. W. F.	Wiki	2017	Incorporating wiki technology in a traditional Biostatistics course: effects on university students‟ collaborative learning, approaches to learning and course performance
Kassem, M.	Wiki	2017	Developing business writing skills and reducing writing anxiety of Efl learners through wikis
Liu,X., Jiao, J., Chen, J.	Wiki	2016	Writing collaboratively via wiki: an English teaching study
Özdener, N.	Wiki	2017	Gamification for enhancing web 2.0 based educational activities: The case of pre-service school teachers using educational wiki pages
Zou, B., Wang, D., & Xing, M.	Wiki	2016	Collaborative tasks in wiki-based environment in EFL learning

In consideration of the criteria determined, the total number of studies decided to be evaluated for the research is 19. Table 3 shows the frequency and percentage values of some of the variables related to the studies.

Table 3. Distribution of Studies based on Year, Country, Subject, Dependent Variables

Variable	Options	Frequency	%
Year	2008	2	10.53
	2009	3	15.79
	2010	3	15.79
	2011	2	10.53
	2014	1	5.26
	2016	3	15.79
	2017	4	21.05
	2018	1	5.26
Country	Turkey	5	26.31
	China	5	26.31
	Saudi Arabia	2	10.53
	Australia	1	5.26
	Greece	1	5.26
	United States	2	10.53
	Germany	1	5.26
	Lebanon	1	5.26
	Egypt	1	5.26
Subject	Blog	8	42.10
	Wiki	11	57.89
Dependent variable	Writing performance	8	42.10
	Natural sciences achievement	1	5.26
	Statistical report writing performance	1	5.26
	Basketball knowledge acquisition	1	5.26
	Reading skills	3	15.79
	Software development skill	1	5.26
	History knowledge acquisition	1	5.26
	Oral presentation skills	1	5.26
	Biostatistics course performance	1	5.26
	Computer (excel) information	1	5.26
Course	English	12	63.16
	Natural sciences	1	5.26
	Statistics	1	5.26
	Basketball	1	5.26
	Software	1	5.26
	History	1	5.26
	Biostatistics	1	5.26
	Computer	1	5.26
Sample Level	Primary School	2	10.53
	Secondary School	1	5.26
	High School	1	5.26
	University	15	78.95

All the studies selected for the research are journal articles. These are all studies written in English examining the effects of wiki or blogs on the academic performance except one of them. It is noteworthy that most of the studies were carried out with university students and in English lessons.

Data Encoding

The step after data collection is the encoding of the study characteristics and the effect sizes which will be the independent and dependent variables respectively (Lipsey and Wilson, 2001). The difference in study characteristics is one of the factors that explain the difference in the effect sizes. A two-sheet file is opened in Microsoft Excel to encode the data for the research. In this file, on the qualitative titled sheet, sequence numbers are given for the studies and for each study, the Publication Name, Publication Type, Year, Country, Publication Language, Subject, Dependent Variable, Independent Variable, and Course Area are specified. The quantitative data of the study are the sample‟s grade level, total number of participants, experimental group number of participants, control group number of participants, experimental group mean, control group average, experimental group standard deviation, control group standard deviation and p value, if necessary, the direction of the effect, F value, effect size, and the notes of additional information.

Data Analysis

It is necessary to analyze different values (means, standard deviations and number of participant) in different studies which will be evaluated in the research with a common unit of measurement. This common unit is the effect size. Effect size can be calculated in two different forms as *g* and *d* values. The important factor here is to choose the correct type of calculation that is appropriate for the purpose of the research (Egger, Smith, & Phillips, 1997).

The d value is utilized to make calculations from the mean differences between the experimental and control groups (Hunter & Schmidt, 1990). Instead of the d value, the g value can be used in the calculations based on the difference between the group averages. In the current study, analysis is performed by using Hedge‟s g value and 95% confidence interval. CMA (Comprehensive Meta-Analysis) program is utilized to perform calculations.

Findings and Discussion

Determination of Heterogeneity

Heterogeneity test is important in terms of observing the change of the effect size between the studies. The Cochran‟s Q statistics (Chi-Square heterogeneity test), that has become a classical way to determine whether the studies in the research are homogeneous or heterogeneous, is applied. Q value is given in Table 4. As can be seen in Table 4, Q value is 202.569. When we considered the X^2 critical values table, it can be observed that the Q value exceeds the critical value that is 38.582. Therefore, it can be said that the research is heterogeneous.

Table 4. Average Impact Size, Homogeneous Distribution Value of the Studies according to Impact Model, df and p Significant Difference Level, X^2 Critical Value

Model	N	Point Estimate	Standard Error	Variance	Q value	dF(Q)	P value	X^2
Fixed	19	0.526	0.062	0.004	202.569	18	<0.001	91.114
Random	19	0.740	0.215	0.046				

Selection of the Effect Model

The selection of the statistical model is effective in combining the results of the research. Three types of effect models can be used in the meta-analysis where the results of the research are expressed in a common unit of measurement. These are the fixed effect model, random effect model, and mixed effect model. Model selection is decided according to the heterogeneity of the studies. Fixed effect model can be used in the cases where all of the studies included are assumed to have the same effect. This model assumes that the variance in the study results is caused by the interrelated data (Sutton et al., 2000). The standard deviation of the population effect sizes of all studies is equal to zero. Therefore, it would be appropriate to use the results of the research if a homogenous structure is observed. The random effect model is used in the studies in which the effect sizes in the studies differ from each other. The standard deviation of the population effect sizes of all the studies is different from zero (Ellis, 2010). Therefore, it is appropriate to apply for the studies that the distribution is heterogeneous. In addition to the differentiation in the effect sizes, there are also additional factors in the mixed effect model (Cooper, 2010). In the study, it is observed that the distribution is heterogeneous, and random effects model is selected and analyzed. General effect size for academic performance is given in Table 5.

Table 5. General Effect Size for Academic Performance

Heterogeneity	df	General Effect Size	95% Confidence Interval
Total Q 202,569	18	0.740	0.320-1.161

According to Table 5; the maximum limit of 0.215 standard error and 95% confidence interval is 1.161, the lower limit is 0.320 and the effect size (E ++) is 0.740. According to Cohen (1981), .20 value for E++ is accepted as small, .50 is middle and .80 is high. From this point of view, according to the classification of Cohen (1981), it can be said that the effect size takes place in the middle range. Therefore, it is observed that the impact of web 2.0 on academic performance is positive and moderate.

Impact sizes of studies included in meta-analysis and average impact size table chart by random effects model with confidence interval are given in Figure 1. Starting from the left side, table in Figure 1 shows the study names, the effect sizes of each study, and distribution of confidence intervals. In Figure 1, while the effect size is found to be positive in fourteen out of nineteen studies; in five studies, it is found to be negative. This situation indicates that web 2.0 has a negative contribution on academic performance in five of the studies. However, the effect size of only one of these five studies takes place within the wide range according to the classification of Cohen (1982). When the general situation is observed, it can be said that there are no large deviations and there is a regular distribution.

Studies	Effect Size	Lower Limit	Upper Limit
Şimşek (2010)	0,587	0,114	1,061
Koçoğlu (2009)	1,377	0,512	2,243
Chuang &Shen (2008)	1,192	0,689	1,696
Alshumaimeri (2011)	2,785	1,943	3,626
Li et al. (2014)	0,462	0,079	0,846
Neumann&Hood (2009)	0,467	-0,076	1,011
Papastergiou et al. (2011)	-0,270	-0,567	0,027
Arslan&Kızıl (2010)	0,690	0,213	1,167
Hsu&Wang (2010)	1,167	0,574	1,760
Ras&Rech (2009)	-0,158	-0,519	0,203
Heafner&Friedman (2008)	2,202	1,407	2,997
Fattah (2016)	1,140	0,409	1,871
Yakut&Aydın (2017)	-2,523	-3,620	-1,427
Awada&Diab (2018)	-0,185	-0,862	0,492
Fong et al. (2017)	1,939	1,299	2,580
Kassem (2017)	-0,623	-1,213	-0,034
Liu et al. (2016)	2,364	1,709	3,018
Ozdener (2017)	0,640	0,080	1,199
Zou et al. (2016)	0,748	0,134	1,363

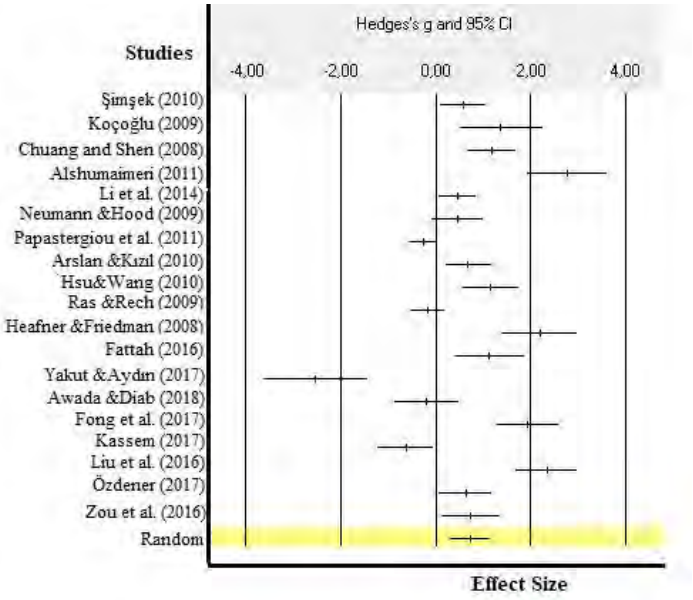

Figure 1. Impact Sizes of Studies Included in Meta-Analysis and Average Impact Size Table Chart by Random Effects Model with Confidence Intervals

Study Weights

Study weight values allow to see the contribution of all studies selected for this study on the overall effect size. Figure 2 shows the study weights more clearly. The study weights included are indicated by the thickness of the red line next to them according to their strengths.

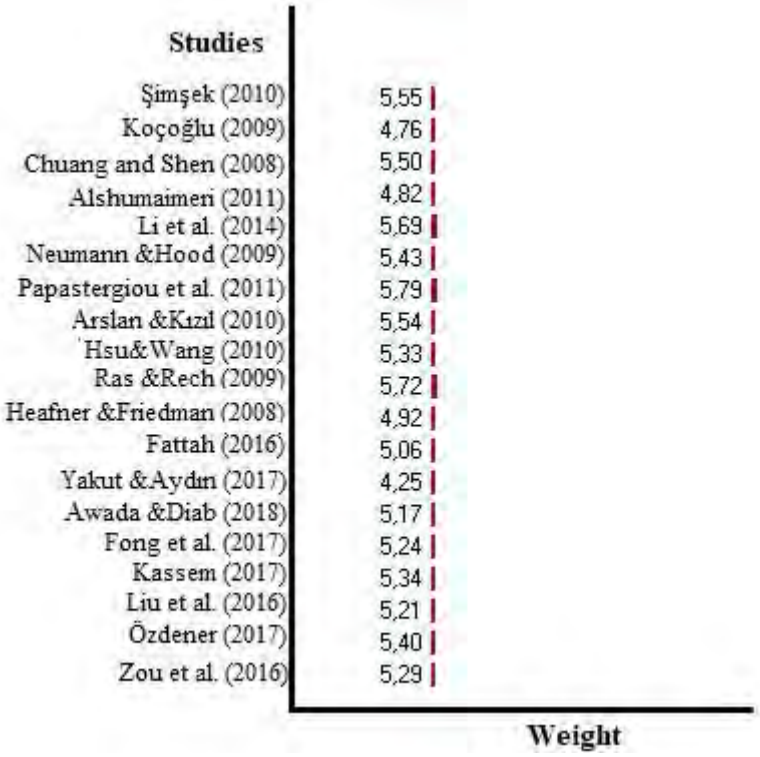

Figure 2. Study Weights

The study weight is calculated by dividing the total number of participants in the studies included in the analysis by the total number of participants in all studies included in the meta-analysis. When Figure 2 is observed, the study weights are between 4.25 and 5.79. Thus, it can be said that the study weights are close to each other.

Conclusions and Recommendations

The overall effect value (E ++ = 0.740) achieved at the end of the study takes place in the near-high interval. This is a finding that shows the positive effect of web 2.0 on academic performance. Therefore, it is important to encourage the frequent use of web 2.0 in education. However, technical factors, such as in which web 2.0 can be used in which course, should be considered. Higher education students were preferred as the sample level in 78.9% of the studies included in the present study. This shows that while examining the effect of wiki and blog on development of academic performance, the selection of age level that can use these technologies effectively is important. As age increases, students' ability to use computer technologies efficiently increases (Colley and Comber, 2003). University students of our time are eminently exposed to technology. Students in the 18-25 age group reported higher levels of technological proficiency (McCoy, 2010). Therefore, it can be said that the education levels of the students are determinant in the positive effect wiki and blog have on academic performance. The effect size values for higher education and K12 as two different education levels are 0.71 and 0.845, respectively, of which both values reflect the positive effect. According to the classification of Cohen (1981), it can be considered that wiki and blog have an average effect on academic performance, while this value is high in K12. When the effect size values for the included studies are reviewed, it is seen that the negative effect size values belong to the studies in higher education context. On the contrary, there is no negative effect size value in studies conducted at K12 level. This result shows that wiki and blog are more effective on academic performance of students at K12 level.

The results show that wikis and blogs contribute to the improvement of academic performance. This is a finding that can provide resources for future research on wiki and blogs' contribution to education. The first data that can be accessed in the light of the determined criteria was obtained in 2008. Therefore, all the results from the earliest research that can be reached to the findings in recent years have been combined and a stronger result has emerged. This result can guide both field researchers and practitioners. The results of the current study can be interpreted that wikis and blogs are more successful than traditional classroom environment in terms of academic achievement. They are also consistent with the results of the individual studies conducted at different years (Chuang and Shen, 2008; Heafner and Friedman, 2008; Çiftçi, 2009; Koçoğlu, 2009; Neumann and Hood, 2009; Ras and Rech, 2009; Arslan and Kızıl, 2010; Hsu and Wang, 2010; Şimşek, 2010; Alshumaimeri, 2011; Fattah, 2016; Liu et. al., 2016; Zou et. al., 2016; Yakut and Aydın, 2017; Kassem, 2017; Özdener, 2017). When the literature is examined, meta-analysis studies on the contribution of web 2.0 to educational outcomes are limited. Therefore, the current study is unique in a way that it compiles the studies obtained from the literature that focused on the impact of web 2.0 on academic performance. Twelve of the 19 studies included in the study have examined the contribution of web 2.0 to teaching English as a foreign language. This finding is important in terms of showing that approximately 65% of the studies included in the study conducted the same field. Therefore, it can be said that wikis and blogs are used most effectively in foreign language teaching.

As in any educational research, the present study is also bound with some limitations. Since only the contribution of wikis and blogs on academic performance is examined in the current study, after applying inclusion criteria on search results, the number of studies included in the study was limited with 19. One of the criteria is the inclusion of only journal articles. The reason for this is that journal articles go through the blind review process. Therefore, they are exposed to more objective evaluation. Other criterion is the inclusion of pretest posttest control group studies. In order to further improve our understanding of wikis and blogs in education, studies are needed in two major areas: native language teaching and writing teaching. This will help fill a large gap in the literature. Wikis and blogs are used frequently in teaching EFL. However, the studies conducted regarding the contribution of wikis and blogs to writing education in native language are limited. Studies can be done to improve essay writing skills with the help of wikis and blogs. In addition, although many studies examined the effects of Web 2.0 environments on educational outcomes, the number of experimental studies with pretest and posttest control groups is limited. Therefore, researchers can contribute to the literature by carrying out such studies.

A separate meta-analysis for each environment would have been useful and interesting. Also, researchers can conduct a comparison and discussion of the two mediums in education. Such a study can give practitioners an idea of which environment can be used more effectively in which field teaching. In the studies to be performed in the future, the selection of the study by including more web 2.0 tools may help to observe which type of web 2.0 provides more effective results in which areas. In addition, if the included studies are increased in number, the relationship between some variables (course type, teaching level) and the effectiveness of web 2.0 environments can be examined. In case the researchers perform meta-analyses including the podcasts, social networks, rss, and other topics as covered by the concept of web 2.0, the number of studies included will be larger and the results of the research will provide more in-depth information. However including variety of technologies in one analysis will bring its own challenges such as differences in studies‟ contexts and utilization of technologies. In addition, the conduction of meta-analyzes measuring other variables such as attitude, self-efficacy, and anxiety other than the academic performance can be significant in terms of predicting the traces that web 2.0 will leave in the world of education. Promoting the use of web 2.0 environments, which are becoming increasingly popular for non-educational purposes such as sociability, spending leisure time and using for educational purposes, is an important factor in the learning process of students. In the light of the suggestions, conducting new studies is important for effective use of wiki and blog technologies.

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