Can Plagiarism Detected by Software be Prevented through Education? An Experimental Study with Preschool Teacher Candidates

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To cite this article:

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Article Info	Abstract
	In this study, the effect of science and research ethics course on preschool teacher candidates' possible plagiarism behaviors was examined. Fifteen teacher candidates were asked to prepare a written assignment (pre-test) before the start of the course. Similarly, a second written assignment (post-test) was taken at the end of the course which took approximately 12 weeks. Both assignments received from teacher candidates were evaluated in two similarity/plagiarism software programs and the similarity rates of each student's homework were calculated as a percentage. The Wilcoxon Signed Ranks Test was used to test whether there was a significant difference between these percentage scores in terms of pre-test and post-test. In addition, teacher candidates' pre-test and post-test assignments were subjected to document analysis in the context of the matches determined by similarity/plagiarism software programs. According to the findings of the study, it was seen that science and research ethics course could have an effect on possible plagiarism behaviors of teacher candidates. The findings of the study were discussed regarding similarity/plagiarism software programs, course period and literature. Suggestions were made to help teacher candidates and to those who are concerned about avoiding unethical practices.

Introduction

With the developing technology, the possibilities of accessing information and presenting it when necessary have been accelerated and become easier. Internet technology, which is carried out via connecting millions of computers in the world through a network, provides access to large information and information banks. It is quite difficult not to be affected by this phenomenon. A person who connects to the internet from anywhere in the world can access the information bank from anywhere and transfer the information s/he has acquired to his computer. With the effective use of information technology, people have the opportunity to access all kinds of information whenever and wherever they want (Hilton & Canciello, 2018; Mwingirwa & Miheso-O'Connor, 2016; Sahin & Thompson, 2006; Serhan, 2019; Wallace-Spurgin, 2019; Yıldız, Sünbül, Koç and Halis, 2004). In addition to numerous national computer networks, international networks are rapidly expanding in order to transfer information from one computer to another. Sharing of large information and information databases is possible with this technology. With the help of the most widely used internet computer network, every computer user can access and benefit from the information bank anywhere in the world and transfer information to their own computers (Binboga Yel & Korhan, 2015; Namyssova et al., 2019; Perdana, Jumadi, & Rosana, 2019; Sulak & Sünbül, 2007; Şahin, 2005). Rapid developments in information and communication technologies lead to the abandonment of conventional methods of the physical world in the production and consumption of information, scientific and cultural products as in all other fields. These developments shape the patterns of production, dissemination and transmission of education, science and literature through consumption channels and consumption patterns in an extraordinary way (Alharthi, 2020; Chua & Lin, 2020; Laadem & Mallahi, 2019; Semiz, 2015; Soparat, Arnold, & Klaysom, 2015).

One of the most important facts that make human beings unique is the ability to create and produce. In this sense, humanity's productions such as science, art, technology, humor etc. can occur in vastly different arenas. When a person wants to produce "something", they must first look at what the others have done before, what methods or techniques they have used, and then check on the results. If it is something that represents a scientific/academic value, this sequence is followed in a similar manner. If the individual is spending effort to produce something that is scientific/academic, they are expected to benefit from the previous studies within the framework of certain rules and at the same time expected to reach a certain unique specificity. The use of previous scientific products within certain rules and attaining a unique value evokes some of the more frequently mentioned concepts: academic ethics and plagiarism. Plagiarism is simply defined as copying someone else's words or ideas without citing them, giving false information and changing words and not

showing a reference (Yavuzdoğan, 2017). In another definition, in the Dictionary of Turkish Language Institution, it is "*[t]aking chapters, lines from others' writings, showing them as their own writing or adopting and telling others' subjects/ideas as if they are his/her ideas and expressing them in a different way.*" In 1999, the Committee on Publication Ethics (COPE) defined plagiarism as follows:

> *Plagiarism ranges from the unreferenced use of others' published and unpublished ideas, including research grant applications to submission under "new" authorship of a complete paper, sometimes in a different language. It may occur at any stage of planning, research, writing, or publication: it applies to print and electronic versions.*

Plagiarism has been the most discussed topic and become a major problem in graduate students' and even doctoral students' products (Gücükoğlu & Ayvaz Reis, 2014; Ersoy, 2014). It appears in different forms both in academic papers and student assignments (Eraslan & Zehir Topkaya, 2018). The educational dimension of the work is becoming more and more prominent. However, plagiarism has moved to a different dimension with the increase of information accessible via the Internet. The information on the Internet is open to public and this increases plagiarism (Özenç Uçak & Gülşen Birinci, 2008). So, what are the types of this widespread behavior? Presenting someone else's work as your own; including important parts of text in a single source without making changes (copying); changing keywords and phrases, but protect the important content of the resource; explaining many matching sources in different words and overwriting the author's previous work without giving any references (recycling); perfectly combining the text copied without showing source with the ones that are referenced; mixing material copied from many sources; including resources that do not exist or are incorrectly informed about resources. Including appropriate resources but almost no original work or very close to the original text or structure are the behaviors defined as plagiarism (Gücükoğlu & Ayvaz Reis, 2014). There is also a list formed by TUBITAK (2006) regarding ethical violations under the title of "What is unethical?" The first one of these is fabrication which is to produce, report or publish data that does not exist in the research. The second one is falsification which means modifying results of research materials, devices, processes and research records or change them to get different results. And the third one is called plagiarism defined as using the methods, data, writings and forms of others without referring to their owners. There are also other violations such as sending or publishing the same research results to more than one journal for publication called duplication. Least publishable unit means publishing a large number of publications by improperly separating the results of a research and disrupting the integrity of the research. Not mentioning the scholarships/contributors is also a violation which is defined as not mentioning the support of the institution or organization that helps the research. Changing the author names and conducting other kinds of behaviors incompatible with the principles of research and publication ethics are also included on this list. Günbayı, Kasalak and Özçetin (2013) carried out a qualitative study related to the opinions of graduate students about unethical behaviors in the scientific studies. According to the results of their study, the participants stated the following actions as unethical behaviors: instructors and students show unauthorized ownership, scientific researches done by others instead of the researcher himself, the accurate information is not searched, changing/deflecting the data and the use of female identity. The students also shared their opinions regarding the reasons of these behaviors. Not willing to spend effort, shortage of time, academic promotion, unconsciousness, incomplete information, laziness, the reality of appreciation of unethical studies and being inadequate are expressed as reasons to these behaviors. Therefore, they thought that spending time, money and effort in doing these unethical behaviors harm the development of science.

In order to prevent such behaviors, ethical awareness, questioning, ethics boards, punishment, workload reduction and task separation, control mechanism creation, shortening the publication process, software prevention, elimination of false perceptions in information production, conducting focused studies suggested discouraging personal ego and peer review (Günbayı, Kasalak & Özçetin, 2013). Countries impose legal sanctions on the prevention of unethical behavior and plagiarism (Özenç Uçak & Gülşen Birinci, 2008). For instance, in December 2016, the regulations of the Higher Education Law stated plagiarism as a form of ethical violations. It should be noted that these regulations, although pleasing, are insufficient because practices are not fair. For instance, an academician who fails to put someone's direct words in quotation marks is fired from the university. The punishment does not depend on how bad is the behavior so it seems quite unfair and needs to be reconsidered (Yavuzdoğan, 2017). It is known that many unethical practices in scientific studies stem from lack of education so considering that the initial stage of plagiarism is student years providing education during the student years is crucial (Özenç Uçak & Gülşen Birinci, 2008; Özkaya & Güner, 2019). While technology and internet cause an increase of plagiarism they can also help the detection of it (Gücükoğlu & Ayvaz Reis, 2014). It is possible to say that various experimental studies have been conducted to prevent plagiarism. Barrett and Malcolm (2006) in their study asked 182 masters students to summarize their research papers on a selected topic. Prior to this assignment, they provided students with trainings in academic ethics, resource searching and anti-plagiarism. Afterwards, the texts obtained from the students were evaluated in a similarity-detection

software program and the results were shared with participants. As a result of these exchanges, a second assignment was requested from the students, and it was concluded that the plagiarism rates of the students decreased considerably after these trainings. Likewise, Fazilatfar, Elhambakhsh and Allami (2018) conducted a research study and implemented a training program based on avoiding plagiarism of undergraduate and graduate students. The results of the study revealed that the provided education had significant effects on students' citation skills and plagiarism behaviors. In a study conducted in Turkey (Balbay & Kilis, 2019) on plagiarism/similarities of software programs it is emphasized that the introduction of these programs not only had a positive contribution to students' written texts but also in their academic presentation skills. In his study, Rieber (2017) implemented a training program with university students based on similarity-detection software programs in order to avoid plagiarism behaviors. In this context, it has been concluded that participants achieved a significant awareness about anti-plagiarism. However, according to the opinions of the students, they had emphasized that the similarity software program had no significant effect on the plagiarism behaviors of the students.

In previous studies, the following topics were examined: students' opinions about plagiarism in general (Demiraslan Çevik & Barın, 2015; Kocdar, Karadeniz, Peytcheva-Forsyth, & Stoeva, 2018; Park, 2003; Remmik, Tasa, Rets & Ilya, 2018; Roos & Löfström, 2019; Toki & Tafiadis, 2014), the effects of teaching similarity-detection software programs (Heckler, Rice and Bryan, 2013; Löfström & Kupila, 2013; Nova and Utami, 2018; Rieber, 2017; Rolfe, 2011), and less frequently the topics of academic ethics and how to avoid plagiarism (Barrett ve Malcolm, 2006; Holt, Fagerheim, & Durham, 2014; Shang, 2018). The effects of anti-plagiarism trainings presented to students in these experimental studies were evaluated in a quantitative context. The literature shows that plagiarism has become widespread student behavior at tertiary level. How samples of academic dishonesty are treated by academics has a significant role in preventing pupils from committing plagiarism-related activities. Academic ethics need to be introduced to students in earlier stages of their education and all educators at all levels of education need to pay attention to examples of plagiarism in their pupils' assignments (Erarslan & Zehir Topkaya, 2018). In this study, possible plagiarism behaviors of teacher candidates were examined in both quantitative and qualitative terms. In this respect, the study may fill an important gap in the literature.

Purpose of the Research

The purpose of the present study is to examine whether science and research ethics-based education given to preschool teacher candidates has an effect on reducing plagiarism behaviors. The basic question of the research can be stated as follows: Does science and research ethics education have a significant effect on decreasing possible plagiarism behaviors of preschool teacher candidates? Within the scope of this basic question, the answers to the following questions were sought:

> 1. Is there a significant difference between the scores obtained from the plagiarism/similarity software of the assignments prepared by preschool teacher candidates before and after science and research ethics education?
> 2. Do the contents of assignments prepared by preschool teacher candidates before and after science and research ethics education differ in terms of plagiarism?

Method

Research Model

This study examines the plagiarism behaviors of preschool teacher candidates in their academic writing tasks. In this context, an experimental procedure was applied to preschool teacher candidate: the students were asked to prepare a short paper about learning theories before and after the experimental process. The data obtained was analyzed on the basis of both quantitative and qualitative methods (Creswell, 2016). The data obtained before and after the experimental procedure was checked for similarity/plagiarism with two different similarity determination software programs in a quantitative scope. The similarity/plagiarism percentages of the texts obtained from teacher candidates' pre-test and post-tests were calculated via similarity-detecting software programs and the scores before and after the experiment were tested to see whether a significant difference between them existed. At the same time, the data (texts) obtained before and after the experiment were subjected to qualitative document analysis and similarity/plagiarism was evaluated in addition to the results obtained from similar software programs. Document analysis can be used as an additional source of information in qualitative research or it can be used as a research method just by itself (Yıldırım & Şimşek, 2016).

The present research is in weak experimental research design with one-group pretest-posttest design. The reason why there was no control group in the research was as it was the first year preschool department. The fact that there was no control group is also discussed under the title of limitations. In this model, an independent variable is applied to a randomly selected group (Karasar, 2010). A pre-test is conducted before the experimental process and a post-test after the application of the experimental process. In this experimental design, the determination of the subjects is not made on the basis of randomness and there is also no matching of the subjects (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2009). The symbolic representation of the experimental design applied in the study is presented in Table 1.

Table 1. The Symbolic Representation of the Experimental Design

Group	Pre-test	Process	Post-test
Preschool Teacher Candidates (n=15)	Homework that deals with Piaget's Cognitive Development Theory	12-week Science and Research Ethics Course	Homework that deals with Bandura's Social-Cognitive Theory

Study Group

The study group consisted of students who chose "Science and Research Ethics" as an elective course at Alanya Alaaddin Keykubat University in Preschool Education Program of Education Faculty during2018-2019 academic year. 15 preschool teacher candidates chose the related course. All teacher candidates were freshmen. They have not taken any associate degree or undergraduate education before. Moreover, they have never taken any classes such as scientific research methods or scientific ethics. Six of the teacher candidates were male and nine of them were female. The participants' ages varied from 18 to 23 years.

Data Collection Instruments

In this study, it was investigated whether science and research ethics course has an effect on teacher candidates' plagiarism behaviors. The method of testing their level of compliance with the ethical principles was via an academic writing work/assignment. For this purpose, each teacher candidate was asked to prepare a short homework (pre-test) about Piaget's cognitive development theory. Similarly, at the end of the experimental process, they were asked to prepare a short assignment (post-test) about Bandura's social cognitive learning theory. Teacher candidates were advised not to exceed 3 pages for their homework and it was emphasized that their assignments would not be included in the scoring related to passing the course. In research literature, it is stated that one of the primary reasons for plagiarism, especially among students, is the lack of time and intensive workload (Baysen & Çakmak, 2017; Pupovac, Bilic-Zule & Petrovecki 2008). Teacher candidates were asked to prepare an assignment not exceeding 3 pages to prevent plagiarism. It is reported that there is a high positive relationship between the length of the assignment and the similarity/plagiarism ratio (Do Ba et al. 2017).

The Content of the Science and Research Ethics Course

The science and research ethics course was added to the preschool teaching program by the Higher Education Council in 2018 as a general culture elective course. The course is completed in 12 weeks. The content of the science and research ethics course which was determined by the Higher Education Institution is as follows:

> *Science, the nature of science, its development and scientific research; the concept of ethics and ethical theories; research and publication ethics; unethical behaviors and ethical violations in the research process; ethical issues related to authorship and copyright; biased publication, editing, refereeing and ethics; publication ethics and unethical behaviors during the publication process; legislation and committees on research and publication ethics; ways to identify ethical violations; common research and publication ethics violations and methods to prevent them (p. 17).*

Although the content of the science and research ethics course presented above seems quite sufficient, it can be said that it is too detailed for first year undergraduate students. In other words, "ethical problems of authorship and copyright; situations such as biased publication, editing, refereeing, publication ethics and unethical behavior in the publication process" are quite distant targets for teacher candidates who are freshmen. For this reason, the researchers made some literature-based revisions regarding the course (Akkaya and Yıldırım, 2017; Aydin, 2007; Ruacan, 2005; Turkey Academy of Sciences, 2002; Collective, 2012; Uzbay, 2006) and the course is presented with a revised content. Within the scope of revisions made, "scientific publication", "refereeing"

and "editing" were excluded from the course. Instead, the content is focused upon subjects such as: the nature of science, scientific research, printed and web-based resource searches, preparing homework, types of plagiarism, avoidance of plagiarism, direct and indirect quotation and citation, and sanctions for plagiarism. In addition to the course, teacher candidates were given reading assignments for the importance of scientific ethics (Yaşar, 2018) and prevention of unethical behaviors (Uçak & Birinci, 2008; Ünal, Toprak & Başpınar, 2012). However, since it is thought that it may affect the possible results of the experimental study, teacher candidates were not given any information or training with similarity/plagiarism detection programs.

Experimental Process

The experimental process was applied by the first author of the study. As mentioned earlier, the science and research ethics course is designed to last 12 weeks. In the first lesson, the researcher met with the teacher candidates and had a short conversation (outside the context of the course). In order not to affect the pre-test practice, the first lesson was kept very short and the teacher candidates were asked to prepare a short paper (maximum 3 pages) about Piaget's cognitive development theory before the next class. It was stated that the prepared assignment should be sent to the researcher by e-mail. At the end of the five days, the homework requested from all participants was received via e-mail. Afterwards, the content was presented to the students for 2 hours each week. During the two-hour course, each session had a break of approximately 20 minutes. The researcher did practical work with the students, rather than providing theoretical information about source searches (web or printed), direct and indirect quoting, citing and preparing homework on this basis. In addition, plagiarism samples in the literature were discussed with the students. As one of the practical courses coincided with a national holiday, it was not possible to hold class that week. In the last week, a general evaluation was made. In the 12th week, students were asked to prepare an assignment related to Bandura's social cognitive learning theory and to send it to the researcher within five days. All teacher candidates sent the required assignment via e-mail to the researcher. These assignments were not graded as they were taken as pre-tests and post-tests. During the general evaluation of the last class, an explanation was given to students about the assignments taken at the beginning and at the end of the course. In this statement, it was emphasized that the effect of the science and research ethics course was examined in the preparation of these assignments. All participants were asked to confirm the publication of the results in a scientific study (anonymously) and this consent was obtained in written form from all the participants.

Data Analysis

The data obtained from preschool teacher candidates were analyzed both quantitatively and qualitatively. In the process of quantitative analysis, pre-test texts prepared by each teacher candidate were loaded into two different similarity-detecting programs and the similarity rates were obtained. As Toprak (2016) states, the similarity rates obtained from plagiarism detection programs are numerical values calculated by matching the texts loaded in the relevant programs with the previous texts stored in the database of the program. The texts taken after the application (post-test) were subjected to similar processing. Pre-test and post-test similarity scores were calculated for each teacher candidate by the software programs. These scores were uploaded to the SPSS 16 program. In the analysis of the quantitative data, considering the number of the participants, the Wilcoxon signed-rank test was used to determine the difference between the data obtained from two related samples. In addition, pre-test and post-test texts obtained from teacher candidates were subjected to document analysis in terms of "similarities" determined by similarity-detecting software programs. In this sense, if a teacher candidate did not comply with the rules of citation, then the similarity is determined by software programs, and the similarity ratio is calculated. However, in cases where similarity-detecting software programs did not find any similarity or found similarity at low or ethically expected level, the researchers reached the sources given by the teacher candidate and subjected the related assignment and source to document analysis.

Findings

Quantitative Findings

Table 2 shows the scores of the first (pre-test) and second (post-test) assignments of preschool teacher candidates that are calculated by the first and second similarity-detecting software programs. In order for the table to be more easily understood, the order of the teacher candidates is given starting from the lowest in terms of the post-test scores calculated by the first software program.

Table 2. Teacher Candidates' Pre-test and Post-test Scores from the First and Second Similarity Software Programs

Teacher Candidate	Similarity Score Calculated by the 1st Software Program		Similarity Score Calculated by the 2nd Software Program	
	Pre-test %	Post-test %	Pre-test %	Post-test %
TC.1	91	1	88	6
TC.2	75	2	79	10
TC.3	98	3	97	3
TC.4	95	8	77	12
TC.5	84	9	65	8
TC.6	99	14	90	10
TC.7	99	24	80	15
TC.8	42	25	42	10
TC.9	26	43	24	32
TC.10	51	43	31	33
TC.11	69	59	64	37
TC.12	79	74	52	50
TC.13	100	77	96	67
TC.14	66	78	42	66
TC.15	96	88	75	82

In Table 2, it is seen that preschool teacher candidates' similarity percentages of pre-test scores that were calculated by the first and second software programs are quite high. It is understood that in terms of pre-test scores, the similarity calculated by the first software program was 26% for TC9 (Teacher Candidate 9), this percentage is followed by TC8 with similarity of 42%. According to the first software program, all other teacher candidates have a similarity rate of over 50%. In fact, it was found that 7 of the teacher candidates have a similarity ratio above 90%.Pre-test similarity scores of teacher candidates calculated by the second software program are seen in the right hand columns of Table 1. The pre-test scores of the same texts differ in terms of the first software and the second software programs. The largest difference is found between the scores of TC12. For the first paper prepared by TC12, the first software calculated a similarity of 79%, while the second software calculated a similarity of 52%, showing a difference of 27% between the two different software programs. However, for TC1 and TC3it is seen that the calculations of the two software programs were very close. In fact, both software programs calculated the similarity rate as 42% for TC8.When the pre-test similarity rates of the second software program are examined, it is seen that TC9 had the lowest similarity rate (24%), which is very close to what the other software program calculated (26%). In addition, it is understood that one teacher candidate (TC10) had a similarity rate of 31% and two teacher candidates (TC8 and TC14) had a similarity rate of 42%. The similarity rates calculated for the other teacher candidates' pre-test scores by the second software program were above 50%.

In Table 2, teacher candidates' post-test results regarding the second assignment given at the end of the science and research ethics course can also be seen. In this context, it is seen that the post-test scores of teacher candidates from TC1 to TC8 were calculated as 25% or lower by both software programs. From TC9 onward, it was found that they had similarity rates of 33% and greater. It was found that the first and second software programs differ in terms of post-test score calculations. In general, the second software program found lower similarity percentages than the first program. However, this does not apply to TC1, TC2 and TC4. The post-test scores of these three teacher candidates were calculated by the second software program as having a higher similarity ratio than the first one. The Wilcoxon Signed-Ranks Test results to determine whether there is a difference between pre-test and post-test scores of preschool teacher candidates were given in Table 3.

Table 3. The Results of Wilcoxon Signed Ranks Test of Preschool Teacher Candidates' Pre-test and Post-test Scores from the First and the Second Similarity Software Programs

	Post-test -Pre-test	**N**	**Mean Rank**	**Rank Sum**	**z**	**p**
1st Software	Negative Rank	13	8.35	108.50		
	Positive Rank	2	5.75	11.50	-2.756	**.00**
	Equal	0				
	Pre-test -Post-test	**N**	**Mean Rank**	**Rank Sum**	**z**	**p**
2nd Software	Negative Rank	11	9.68	106.50		
	Positive Rank	4	3.38	13.50	-2.642	**.00**
	Equal	0				

When Table 3 is examined it is seen that there is a significant difference between preschool teacher candidates' pre-test and post-test scores. In terms of the results obtained from the Wilcoxon test and according to the pre-test post-test comparison calculated by the first software program, 13 teacher candidates were in negative rank while 2 of them were in positive rank. In other words, the similarity score of 13 teacher candidates decreased within the scope of post-test and this decline was found to be statistically significant ($p<.01$). Similarly, according to the pre-test and post-test comparison calculated by the second software, 11 of the teacher candidates were in negative rank while 4 of them were in positive rank. The reduction calculated in this section was also found to be statistically significant ($p<.01$).

Qualitative Findings

Document analysis of preschool teacher candidates' assignments before and after the experimental process was performed. As the software programs calculated, there was only one participant remaining under 30% of the pre-test similarity ratio in his assignment (TC9). Therefore, it is clear that other participants did "copy-paste" with varying rates of pre-test similarity. For example, in the pre-test assignment of TC4 titled as Sensory-Motion Stage (obtained from the first software program), the similarity/plagiarism ratio is 95% regarding the first software program and 77% according to the second software program. Paragraph TC4 is marked by plagiarism except for the first word "duygusal" (emotional in English) by the similarity software program. It is possible to say that the first word stems from the fact that the participant misspelled the word "emotional" ("duygusal" in Turkish) as "sensorial" ("duyusal" in Turkish) so that is why the word is not included. The translation below is from Turkish to English regarding the first paragraph of the assignment taken as pre-test fromTC4:

TC4. Sensory-Motion Stage
"0-2 years which is defined as babyhood, is the period that child's physical, mental and emotional development is rapid. The baby learns about the World through listening, feeling and imitating. The most important work of the baby is achieving an awareness of his/her sense organs, realizing his body and learning how to use it.
At this stage while discovering the outside World, the baby uses his/her senses such as seeing and feeling; and the motor skills such as arms, legs and other parts of his/her body."

Therefore, in the context of the pre-test, only the assignment of TC9 was subjected to document review. In the first paragraph of TC9's assignment, it is seen that the teacher candidate introduced Piaget's theory of cognitive development and referred to three different sources. The first and second software programs found no similarity or plagiarism in this paragraph. The researchers reached the book by looking at the bibliography that TC9 added at the end of the assignment and compared the relevant section of the book with the paragraph written by TC9. As shown in the following paragraph, the paragraph in the reference book was taken word for word and added to the assignment by TC9. The translation below is from Turkish to English regarding the first paragraph of TC9 taken as pre-test homework calculated by the First Software:

TC9. Cognitive Development: Jean Piaget
In his cognitive development theory, Piaget, emphasized the importance of the interaction between maturation and learning and indicated that the interaction between children's experiences and their biological maturation levels provide them understand their environment. According to this theory, the children's explanations of events and situations differ related to the period of development they are in (Cole & Cole, 1996; Cook-Cottone, 2004; Erden & Akman, 2009).

The translation below is from Turkish to English regarding the first paragraph of TC9 taken as pre-test homework calculated by the Second Software:

TC9. Cognitive Development: Jean Piaget
In his cognitive development theory, Piaget, emphasized the importance of the interaction between maturation and learning and indicated that the interaction between children's experiences and their biological maturation levels provide them understand their environment. According to this theory, the children's explanations of events and situations differ related to the period of development they are in (Cole & Cole, 1996; Cook-Cottone, 2004; Erden & Akman, 2009).

The translation below is from Turkish to English regarding the paragraph in the book that was given by TC9 as a reference:

TC9. Cognitive Development: Jean Piaget
In his cognitive development theory, Piaget, emphasized the importance of the interaction between maturation and learning and indicated that the interaction between children's experiences and their biological maturation levels provide them understand their environment. According to this theory, the children's explanations of events and situations differ related to the period of development they are in (Cole & Cole, 1996; Cook-Cottone, 2004; Erden & Akman, 2009). "

As shown in the three paragraphs above, TC9 quoted directly from a book on the subject instead of the resources on the Internet (and thus entered into the databases of similarity software programs) in the process of preparing the assignment requested from him as a pre-test. However, this citation was taken word for word as it was written in the source. Thus, TC9's assignment with a 26% or 24% similarity ratio which was calculated by both software programs contains more serious ethical violations.

After the implementation of the experimental process, it was seen that there was a general decrease in the similarity rates calculated in the assignments received from the teacher candidates. For example, TC2 decreased from 75-79% similarity rate to 2% in the first software program (10% in the second software). In this context, the post-test assignment of TC1 was subjected to content analysis. Two paragraphs of TC2's assignment are presented below. The translation below is from Turkish to English regarding the paragraph taken from the assignment of TC2 as post-test and calculated by the Second Software:

TC2
"Primarily, social learning theory focuses on psychological and moral assessments of the individual they vary in every age or individual if we learn these differences or work on these differences, we should observe those individuals very well and monitor their education very closely.
These studies are mostly used on individuals at young age (1,5,10) because they have the capacity to learn everything more easily. In order to benefit from these individuals, we cannot obtain sufficient information just through observation and research. For this reason, we have to use various tests, various scales of practice, and we should apply these studies to the social environment where there are more individuals."

It is seen that neither of the software programs found any similarities in the paragraphs. The teacher candidate reported two articles in his bibliography and emphasized that he prepared this assignment within the scope of those articles. However, no reference was given at the end of the paragraphs. As mentioned, two different manuscripts are added at the end of the text. At the same time, the main components of social learning theory are not introduced neither in these paragraphs nor throughout the assignment by TC2. The teacher candidate instead reflected his views on social learning, which were inspired by the two articles he read. In addition, it can be said that there are grammatical and spelling errors in the paragraphs.

TC4 had a 95% similarity rate in terms of the pre-test assignment calculated by the first software program and this rate calculated by the second program was77% but the similarity percentages of the assignments decreased in the post-test and the ratio was calculated was 8% by the first software program and was 12% by the second one. The paragraph in TC4's assignment has shown that both software programs could not find any similarities. As it can be seen TC4 wrote a long paragraph on social learning theory and cited three different references at the end of the paragraph but added another reference that cites these three references s/he already mentioned. The citation of TC4 was found by the researchers via searching the internet and then examined within the scope of the information. In the last paragraph, the relevant part of Bayrakçı's (2007) article presented by TC4 as citation is presented. In his study, Bayrakçı (2007) used two different paragraphs in introducing social learning theory in the context of literature, and cited [Neill & Fleming, (2003)] in the first of these paragraphs. In the second paragraph [Ültanır (2007)] was cited. TC4 took these two paragraphs from Bayrakçı's (2007) study and formed a single paragraph and added them to his homework. It is surprising at this point that TC4 did not write the same things or was not applying copy-paste while referencing sentences of Bayrakçı (2007) who was citing [Neill & Fleming, (2003)] and [Ültanır (2007)] in his study. TC4 read the relevant paragraphs and attempted to recapitulate without disturbing the original meaning. The final sentences of both texts could be a good example of this. According to the expression of Bayrakçı (2007) which was written based on [Ültanır (2007)], "for example, we cannot learn by trial and error in the recognition of a poisonous snake" was re-expressed by TC4 as "for instance, we cannot learn by trial and error in the recognition of a poisonous scorpion". However, it is still debatable to what extent it is ethical to give the two different paragraphs in the same study in the form of a new single paragraph with a citation.

The results of the document review on the other post-test assignments discussed in this study had very similar content. It is seen that in terms of post-tests, participants with a rate of 25% or less, as TC2 received, were emphasizing their own comments on the topic or citing from one single source as TC4 but were "recapitulating" the sentences. It can be said that teacher candidates who had similarity rate of 30% or more in terms of post-test assignments failed in the process of preparing their assignment by copy-pasting. In addition, the fact that they had high similarity rates that can be easily detected, even without document analysis, suggests that they did not address the subject of science and research ethics sensitively. The translation below is from Turkish to English regarding the paragraph taken from the assignment of TC4 as post-test and calculated by the Second Software:

> "According to Albert Bandura and other social learning theorists mental development is the building block of learning. On the other hand, according to a research that behaviorists conducted when learning theory is applied on other species and human beings, it concludes similar results. However, still, social learning theorists mentioned that there are also differences between humans and other species as well as similarities as human brain is difficult to explain and found the theories of behaviorists insufficient. Behaviorists' approach to people is wrong compared to social learning theorists and they criticize and say that they ignore learning through social observation in their research. As for social learning, individuals' lives or what they do are examples for other individuals. People sometimes live by observing another being and sometimes they live by learning in different ways. According to social learning theorists, during the observation, the reward and punishment method is used to reinforce behaviors and they have serious effects on the individual. Reward or punishment have an undeniable impact on interpersonal communication. According to social learning theorists and Bandura, the reward-punishment method found in social learning theory is an example of learning through observation. As a result, social learning can be defined as "behavior change through observation" and "learning from the environment". Memorizing, seeing or experiencing certain behaviors is not enough. For instance, we cannot learn by trial and error in the recognition of a poisonous scorpion (Ültanır, 1997; Neil & Fleming, cited in Bayrakçı, 2007)."

The translation below is from Turkish to English regarding relevant paragraphs from the article of Bayrakçı (2007) that was given in TC4's assignment as a reference

> "Social learning theorists argue that the way people think, plan, perceive, and believe forms an important part of learning. In addition, these theorists pointed out that although the rules of learning adopted by behaviorists and many experiments on animals are similar to those of humans, they still remain incomplete and inadequate in explaining more complex human behavior and human learning. Social learning theorists think that behavioral theories approach people as individual animals and ignore the social dimensions of learning. Moreover, many reinforcements in humans are social. In behavioral experiments, animals do not have the freedom to choose their environment and their environment does not change with the presence of them (Neil & Fleming, 2003). However, people not only have the freedom of choosing their own environment but they also affect and change it. Within the society, individuals learn by watching and observing other people, observing how their behaviors are reinforced or punished and through these observations they learn. Therefore, social learning can be defined as "learning from the environment by watching others" or "learning within and for the community". While we are learning some skills such as cycling and swimming through trial and error, we learn some others by just observing others. Learning by trial and error is not always possible. For example, the recognition of a poisonous snake cannot be learned by trial and error (Ültanır, 1997)."

Discussion and Suggestions

In this study, the effect of science and research ethics education on possible plagiarism behaviors of preschool teacher candidates was examined. The data (assignments) obtained before and after the experimental procedure were analyzed both quantitatively and qualitatively. In this context, the assignments received were examined in two similarity/plagiarism detection software programs and quantitative analyses were completed depending on the similarity/plagiarism ratios calculated by the software programs. The similarity/plagiarism percentages regarding the assignments received from the teacher candidates before the experimental procedure were found to be quite high by both software programs. One of the important questions is what the similarity rate should be in order to not be considered as plagiarism. Although the level of similarity obtained from the software programs varies according to the type of the academic study (article, master's thesis, doctoral dissertation, etc.), the university and even according to the academic journal, it can be said that between 15% and 30% might be an acceptable limit. However, Ballard (2013, cited in Toprak, 2016) reports that the general acceptance rate in the academic world is known as 15% or less. In the present study, considering the possible plagiarism behavior of

the group that was studied who are in their first year at the university, it was assumed that an acceptable rate could be 30% or less without the references section at the end of the assignment.

In another study (Rolfe, 2011), which may be considered to be close to the context of the present study, the rate of similarity was also taken into consideration as 30% and below. It was seen that almost all of the teacher candidates who were evaluated via their first assignments (pre-test) had over 30% plagiarism. Considering the similarity rate of 30% and less, it is seen that only one teacher candidate achieved this performance regarding pre-tests. Therefore, if only similarity-detecting software programs were considered, it could be said that only one teacher candidate did not exhibit plagiarism in terms of pre-tests. However, qualitative analyses were also performed on the basis of document analysis. As a result of the qualitative analyses performed within the scope of the pre-test results, it was seen that there were texts taken from other books in an illegal way that both similarity/plagiarism software detection programs could not determine. Therefore, it can be said that it is very difficult to determine a possible plagiarism just on the basis of plagiarism detection programs.

Another result reached in the study was that similarity/plagiarism detection software programs performed calculations for the same texts at different rates. As emphasized in the findings section, sometimes this difference can reach up to 27%. Nevertheless, the fact that there is no difference between 30% and less than that in terms of both software programs can be considered as a positive feature. In other words, the similarity calculations of the two software programs within the scope of the assignments examined in this study were calculated for students who were 30% or less. Nova and Utami (2018), in their suggestions based on the results of their study, emphasized the examination of student assignments with different plagiarism/similarity software detection programs. It can be said that the gap regarding this issue is filled to a certain extent in the present study.

After the application of the experimental process, the assignments (post-test) taken from the teacher candidates were examined via similarity/plagiarism detecting software programs. According to the calculations of the first software program in terms of post-test and pre-test scores, while the similarity percentage ratios of 13 participants decreased, there was an increase in the similarity percentage ratios of 2 participants. According to the second software program, while the similarity percentage of 11 participants decreased, 4 of them had an increase in their similarity percentage ratio. The results of the analysis conducted to determine whether these reductions found by the software programs are significant or not show that the reduction levels obtained from both software programs were statistically significant. Therefore, the finding that teacher candidates' similarity scores before and after the experimental process were significantly decreasing and the differences between them were statistically significant, indicates the possible effectiveness of the experimental process. When viewing these results, it can be said that the science and research ethics course was effective in reducing possible plagiarism behaviors of teacher candidates.

However, the similarity/plagiarism acceptance rate was 30% or lower for this study. In this context, it was seen that only 8 participants had scores of 30% or less in the post-tests. For the other 7 teachers, it can be said that there is a decrease in similarity/plagiarism ratios, yet they are still over 30%. In conclusion, in terms of quantitative findings, it can be said that the experimental process is effective for more than half of the teacher candidates. This result overlaps with previous experimental study results in the field (Barrett & Malcolm, 2006; Baysen, Baysen & Çakmak, 2017; Dodigovic & Jiaotong, 2013; Fazilatfar, Elhambakhsh & Allami, 2018; Holt, Fagerheim, & Durham, 2014; Shang, 2018). Furthermore, it is reported that there is a decrease in the plagiarism behaviors of students when similarity software detection programs are introduced/taught to students (Batane, 2010; Rieber, 2017). This result of the study shows that, considering the plagiarism seen in masters and doctoral theses (Toprak, 2017) and even only considering doctoral theses (Ison, 2012) it is obvious that a plagiarism-informed education can be very useful in preventing plagiarism. On the other hand, some studies (Rieber, 2017; Rolfe, 2011) show that the education offered to students on the basis of similarity software detection programs had no effect on plagiarism behaviors of students.

There were striking results in terms of teacher candidates' post-test assignments which were also subjected to document analysis. Some of the teacher candidates who had high plagiarism behaviors in the pre-test assignments reached significantly low similarity percentages in the post-test assignments. However, as a result of document analysis, it was seen that teacher candidates instead made an inference to the extent they understood from their readings of the related articles rather than answering the questions within the framework of conceptual and theoretical foundations which the given assignment was asking. To put it clearly, instead of presenting information about the concepts of "mutual determinism, self-efficacy, self-regulation, etc." discussed in Bandura's theory, these teachers tried to write their own understanding of the articles from the educational perspective. This situation relatively reduced the similarity/plagiarism percentage of the teacher candidates.

Experimental process might have an effect on this situation because one of the important concepts presented in the course was explaining how wrong it was to "copy-paste" in terms of science and research ethics and how important the concept of "originality" was. It is emphasized that the replication of another author's products is a behavior that prevents the operation of one's own mental processes as well as stealing that author's efforts that were put into that work, in other words "plagiarism". In addition, according to another result, it was seen that when compared to pre-tests, some post-test assignments showed that teachers who had low similarity ratios were found to prepare their assignments within the frame of conceptual and theoretical foundations. The document analysis on the basis of these assignments, which were highly acceptable by similarity/plagiarism software programs, revealed some facts. In this context, it was seen that some teachers reached one or two sources and presented the information given about the assignment in their own words by recapitulating and conveying it. In the experimental process, "direct and indirect citation" rules were applied to teachers in order to avoid plagiarism. It can be said that these teachers attempted to quote indirectly. However, it can be said that they did not/could not learn or they ignored the rules on providing resource diversity and how to give reference. In the literature, it is emphasized that the control of the student texts by the lecturers themselves might prevent misunderstandings about plagiarism (Nova & Utami, 2018).

Conclusion

In conclusion, it can be said that scientific research and ethics-based courses given to teacher candidates might be effective in reducing their plagiarism behaviors. However, the similarity rates calculated by similarity software programs were not sufficient by themselves alone. In this context, although it is not obtained from a scientific source, it is emphasized that students can apply some tricks to mislead similarity/plagiarism software detection programs (pejifa.wordpress.com). The presentation of a part of the text as an image (eg: .jpg format) made it impossible to identify with similarity-detecting programs. In addition, by placing any kind of symbol between the words (eg: a dot or number 1) and painting this symbol in white color prevents the detection of similarity. Similarly, when a prompt sentence or paragraph is enclosed in quotation marks and these quotation marks are painted in white it prevents the detection of similarity of software programs. From this point of view, it should be noted that all academic texts such as homework, thesis, articles, and papers should all be subjected to document analysis in addition to software programs.

Plagiarism software programs cannot evaluate books, book chapters and theses *that are not included* in their databases. This makes it difficult to detect plagiarism and ethical violation. From this point of view, the fact that universities and related publishers upload their works within the legal agreements (for example, copyrights) to the database of similarity detection programs might make a significant contribution. The existence of such a technology is valuable to prevent possible ethical violations.

Recommendations

According to the results of the study, it can be said that the teacher candidates tried to obey the academic ethics rules in relation to the education they got. However, it is understood that it is difficult to achieve this healthily or completely through only 12 weeks and 2 hours of training. Academic writing and ethics based trainings can be offered to students starting from elementary level. In addition, academic writing and ethics courses may be compulsory for undergraduate students. All printed books can be shared with plagiarism/similarity software detection programs on the basis of specific legal agreements. In addition, the theses submitted to universities can be added to the databases of plagiarism/similarity software detection programs as soon as possible and necessary measures can be taken to include them.

Limitations

The present study, which was conducted in an experimental design on the basis of reducing the possible plagiarism behaviors of preschool teacher candidates, has certain limitations. The first limitation relates to the experimental design. There was no control group in the study. In this study, the teacher candidates who were included in the experimental process were freshmen. Beyond that, students were placed at university only depending on multiple-choice exams. At this point, the majority of students in Turkey do not have sufficient information about academic writing skills. In addition, except very very limited portion, students at high school level do not have any courses regarding research and writing ethicsin Turkey. In addition, the studies reveal that far beyond the undergraduate freshmen in the world and in Turkey, plagiarism in masters and doctoral theses is

taken very seriously (Ison, 2012; Toprak, 2017). There are even presidents who have been charged with plagiarism in their graduate studies. It is not particularly desirable to mention people by name here, but a simple internet search is sufficient to prove this fact.

As a second limitation, no qualitative interview data was presented with students in this study. In fact, during the 12-week practice, too many interviews were conducted with teacher candidates. Teacher candidates, for example, found it sufficient to find relevant studies on the internet and added the texts they found to their assignments (in the form of copy-paste) in order to conduct research on the basis of an assignment. Or they went to the library and didn't see it as a problem transferring the relevant texts from one/several books to their assignments word for word as it was in the source.

In this context, they were spending their energy to search on the Internet (to copy and to paste it from the source or copy from a few books) and it seemed very normal to them. As the study was conducted in an experimental design, it was observed that the teacher candidates were often surprised when the researcher expressed any issues related to ethical violations. After the explanations given about ethical violations, it was seen that the students stated serious frustration and frequently asked the following question "*Oh, Teacher! Is that also plagiarism*?" In addition, it should be noticed that several studies (Demiraslan Çevik & Barın, 2015; Park, 2003; Toki & Tafiadis, 2014) have been conducted on students' plagiarism.

Thirdly, data were collected from only 15 teacher candidates in the context of pre-test and post-test. Therefore, plagiarism behaviors of these students were not examined on the basis of their gender. A recent study conducted with 377 university students in Canada (Bokosmatya, Ehrich, Eady, & Bell, 2017) found no significant difference regarding plagiarism behaviors of students in terms of gender.

Acknowledgements

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