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| Research Article / Araştırma Makalesi |

Investigation of Pre-Service Teachers' Opinions About Using Non-Linear Digital Storytelling Method

Doğrusal Olmayan Dijital Öyküleme Yöntemine Yönelik Öğretmen Adaylarının Görüşlerinin İncelenmesi[1]

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Keywords

1. Non-linear digital storytelling
2. Pre-service teacher
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Anahtar Kelimeler

1. Doğrusal olmayan dijital öyküleme
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Abstract

Purpose: The aim of this research is to reveal the experiences of pre-service teachers about the use of non-linear digital storytelling as a teaching method.

Design/Methodology/Approach: Case study, one of the qualitative research methods, was used in this research. 11 pre-service teachers from the Department of Computer Education and Instructional Technology of a state university in the fall semester of the 2018-2019 academic year constitute the working group of the research. Pre-service teachers created non-linear digital stories in Designing and Using Material in Education Course for the seven weeks. Data collection tools are semi-structured interview forms developed by researchers and student reflections. The data were analyzed by content analysis method. Consensus among coders was calculated.

Findings: When the research data were analyzed, two themes, four categories and twenty-five codes emerged. In addition, frequencies expressing the number of students containing each code were determined. There are two categories in positive sides theme: Contributions and purposes. Under negative sides theme, there are also two categories as challenging steps and problems.

Highlights: The results of the research include the results of the pre-service teachers who stated that they learned new programs with this application, had difficulty in making videos, experienced technical problems but wanted to use in their professional life. Based on the results of the research, suggestions were made to practitioners and researchers.

Öz

Çalışmanın amacı: Bu araştırmanın amacı öğretmen adaylarının doğrusal olmayan dijital öykülemenin öğretim yöntemi olarak kullanılması hakkındaki deneyimlerinin ortaya çıkarılmasıdır.

Materyal ve Yöntem: Araştırmada nitel araştırma yöntemlerinden durum çalışması kullanılmıştır. 2018-2019 eğitim öğretim yılı güz döneminde bir devlet üniversitesinin Bilgisayar ve Öğretim Teknolojileri Eğitimi Bölümünden 11 öğretmen adayı araştırmanın çalışma grubunu oluşturmaktadır. Öğretmen adayları Eğitimde Materyal Tasarımı ve Kullanımı dersinde yedi hafta boyunca doğrusal olmayan dijital öyküler oluşturmuşlardır. Veri toplama araçları araştırmacılar tarafından geliştirilen yarı yapılandırılmış görüşme formu ve öğrencilerden toplanan yansılardır. Veriler içerik analizi yöntemi ile analiz edilmiştir. Kodlayıcılar arası görüş birliği hesaplanmıştır.

Bulgular: Araştırma verileri incelendiğinde iki tema, dört kategori ve yirmi beş kod ortaya çıkmıştır. Ayrıca her bir kodu içeren öğrenci sayısını ifade eden frekanslar belirlenmiştir. Olumlu yönler temasında iki kategori bulunmaktadır: Katkılar ve amaçlar. Olumsuz yönler teması altında ise zorlu adımlar ve problemler olmak üzere iki kategori bulunmaktadır.

Önemli Vurgular: Araştırmanın sonuçları arasında öğretmen adaylarının bu uygulama ile yeni programlar öğrendiklerini, öyküleri video haline getirirken zorlandıklarını, teknik sorunlar yaşadıklarını ancak meslek hayatlarında kullanmak istediklerini ifade ettikleri sonuçları yer almaktadır. Araştırma sonuçlardan yola çıkarak uygulayıcılara ve araştırmacılara önerilerde bulunulmuştur.

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INTRODUCTION

Technological advances have been affecting and innovating many areas, including education. To offer a well-qualified education, trainers and researchers follow these advances and use them in educational environments. One of these innovations is digital storytelling. Digital storytelling is the presentation of a story written on a specific subject by enriching it electronically (Kobayashi, 2012). It is an educational method based on constructivism which develops content for clarifying a particular subject and increases learning motivation and participation (Letonsaari and Selin, 2018).

Digital storytelling is divided into three groups as informative/instructive, personal and historical (Robin, 2006). In educational environments, instructive stories are mostly used. For using digital stories more efficiently in these environments, it is necessary to plan digital story creation process (Uslupehlivan et al., 2017). There are some studies on digital storytelling process within the literature (France and Wakefield, 2011; Kajder et al., 2005; Cennamo et al., 2010). Cennamo et al. (2010) define these processes as follows: writing script, developing story board, placing images, creating a digital story and sharing it with others.

Storytelling has various kinds, depending on the script. Many stories used for educational purposes are linear, telling one subject and readers can not affect the end of these stories (Letonsaari and Selin, 2018). Called as linear storytelling, this kind has one pathway. The story has a beginning, development and an end (Cao et al., 2008; Liu et al., 2010). As well as linear scripts, there are some non-linear digital stories (branching) that lead readers to alternative paths. To have an interaction, stories can be enriched with videos, animations, and audio, along with non-linear scripts (Prosser, 2014). Personal digital stories are mostly linear whereas instructive stories can be non-linear (Lange et al., 2019).

Non-linear stories have different pathways (Cao et al., 2008). These stories enable users to regulate and connect various ideas (Liu et al., 2010). To combine parts of the story and establish bridges and links, special software is used (Letonsaari and Selin, 2018). Stories can be created as videos or slides (Cao et al., 2008). Göbel et al. (2008) argue that some software is limited to linear stories and that more software, which will simplify creating non-linear story and can be used by even beginners, is needed. Thus, they have developed a new software. Likewise, Spaniol et al. (2006) suggest that technological equipment and software are needed for creating non-linear digital stories.

Associating non-linear digital storytelling with digital games, Letonsaari and Selin (2018) claim that non-linear structure entails examining the subject in more detail and considering different points of view in a careful manner. Similarly, Rasmusson and Bourne (2017) liken selection paradigm in non-linear digital storytelling to games. Prosser (2014) suggests that non-linear structures are effective in creating personalized learning environments. In addition, there are some researchers who argue that non-linear digital storytelling might create collaborative learning environments (Cao et al., 2008; Liu et al., 2010). For, according to them, connecting different ideas successfully requires teamwork. Spaniol et al. (2006) define linear and non-linear digital stories as follows:

a) **Linear stories:** There is one way for creating stories. Storyteller sets a linear pathway for users to follow. Each part of the content is seen or heard in the same order. Users do not interfere with the order of plots. They can only stop, forward or rewind stories, without changing the end.

b) **Non-linear stories:** The story might have a different ending, depending on user interaction. Thus, rather than one pathway, there are many alternatives. The storyteller combines elements of the story and establishes a connection among many serialized elements. In the end, he/she can lead to various stories, depending on the selection of users at interaction points (Spaniol et al., 2006).

To illustrate these two kinds, Figure 1 presents an example of linear digital story while Figure 2 is for non-linear digital story example:

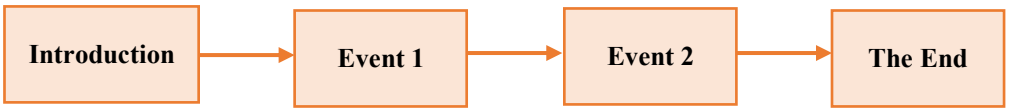

Figure 1. ***Linear story order***

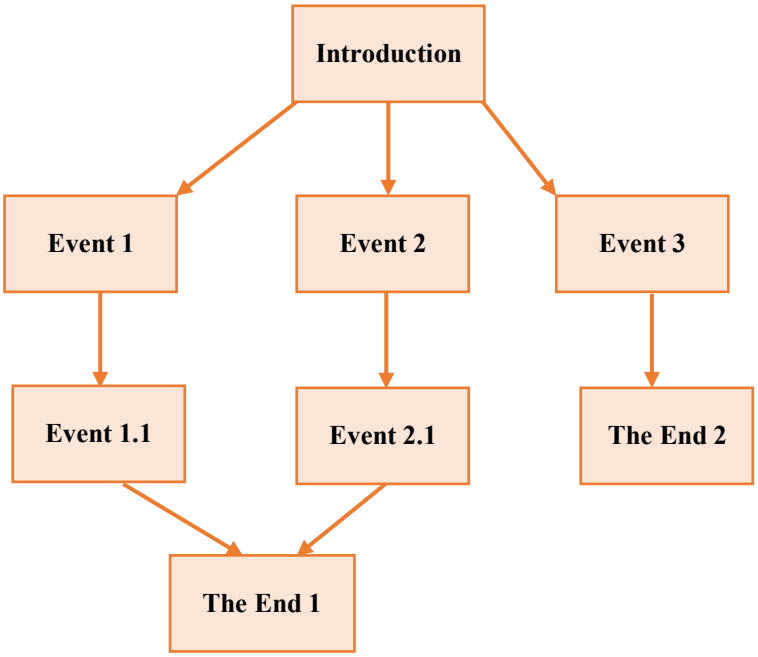

Figure 2. ***Non-linear story order***

There are a limited number of studies on non-linear digital storytelling within literature. In a study that compares linear and non-linear digital storytelling methods in a collaborative learning environment for primary school students, Liu et al. (2010) concludes that those in non-linear group shows better performance regarding reproduction, remix, possession, and positive connection. In their research, Maleki and Sajjadi (2012) also suggest that non-liner storytelling have a positive impact on student participation and motivation. In his study on language learning, Prosser (2014) uses non-linear digital stories with interactive narration structures. In his/her study on non-linear structures' effect on cognitive load, he/she concludes that they do not lead to excessive cognitive load. Letonsaari and Selin (2018) examine how non-linear script writing process is implemented in collaborative learning environments.

With the advent of technological advances, students' expectations have dramatically changed, and they now ask for various methods and materials being implemented in learning-teaching environments (Uslupehlivan et al., 2017). Similarly, emphasizing the need for new approaches in education, Anılan et al. (2018) claim that digital storytelling has the quality to stand out among new approaches and methods that address new educational needs. Rasmusson and Bourne (2017) argue that non-linear digital storytelling might help gain some learning outcomes in various disciplines. For example, it can be used as a non-linear course book or course material according to them. Although these interactive learning environments provide student-centred and constructivist environments, more studies are needed to measure to what extent these environments are created (Prosser, 2014).

In this study, pre-service teachers, who take Designing and Using Material in Education course, are asked to create non-linear digital stories as course materials. Then, their opinions on their experiences in using the method are recorded. By doing so, this study aims to reveal experiences and opinions of pre-service teachers at the department of Computer Education and Instructional Technologies (CEIT) on using non-linear digital stories as teaching method. In this respect, the research problem of the study can be defined as follows:

- What are the opinions of pre-service teachers at the department of CEIT on using non-linear digital stories as teaching materials?

Findings of the study will first contribute to understanding pre-service teachers' attitudes towards technology, who are regarded to be a significant component of technology integration at schools. Secondly, it will give some idea on how to implement digital stories as teaching materials as it illustrates experiences of pre-service teachers in using non-linear digital storytelling as a tool for developing material. Finally, the study will help enhance non-linear digital storytelling processes and demonstrate new research areas on the subject.

METHOD/MATERIALS

Research Model

As this study is on pre-service teachers' experiences in creating non-linear digital stories as teaching material, case study model is used for qualitative research. Case study is a qualitative research method that profoundly examines a case in real life, current

system or particular time; describes it by collecting detailed information from multiple sources and reveals its themes and concepts (Creswell, 2013).

Study Group

The study group of the research includes 11 pre-service teachers who studied in the 2nd grade of the department of CEIT in the Faculty of Education of a state university in Central Anatolian region in the fall semester of the 2018-2019 academic year. There were 7 males and 4 females in the group. Convenience sampling method was used to select members of the research group. As the study was on non-linear digital storytelling, which required technical know-how on using software, pre-service teachers at the department of CEIT were determined as research group thanks to their technology readiness.

Data Collection

To collect data, semi-structured interview form developed by the researchers and students' reflections were used. In their reflections, students write how this implementation contributes to them, the hardships they encounter and things they dislike as well as general opinions on the implementation. While developing interview forms, studies were reviewed in literature. Then, three experts in the field of CEIT were consulted on the form. According to the opinions, a question was changed, and a new question was added in the form. In the end, an interview form consisting of 7 items is constructed. Before it was filled by the study group, the form was tested with another student who had similar traits to the research group to check whether there was a point difficult to comprehend. The semi-structured interview form consisted of questions about in what way non-linear digital storytelling attracted students' attention, the phases they found difficult, and how it might affect teachers and students. The questions in the form included: "Did you have any difficulty using the software? If yes, in which parts?", "Which step of non-linear digital storytelling (script writing, storyboard creating, making video) attracted your attention more? Why?" The interview was carried out face-to-face and on individual basis. It was also recorded. Each interview lasted approximately 10 minutes. Reflections were collected in written form. These papers were obtained from students after the implementation.

Implementation Process

The research was implemented in a computer laboratory with internet connection. As a part of Designing and Using Material in Education course, it lasted for 7 weeks, 4 hours a week. During the implementation, Cennamo at al. (2010)'s five step digital storytelling model was adopted. These steps are script writing, designing storyboard, placing images, creating a digital story and sharing it with others. In accordance with these steps, weekly activities were designed as flows:

- **Week 1:** Non-linear digital storytelling was introduced to pre-service teachers. Sample scripts and videos were presented.
- **Week 2:** The software that can implement the application has been introduced. Students were let free to choose digital story creation program. Most students know programs such as Movie Maker, Adobe Captivate, Adobe After Effects, Adobe Flash. They were also introduced to some web 2.0 tools of digital story creation such as Vyond, Storyboard That etc. Students were asked to write a non-linear script for the next week.
- **Week 3:** The instructor provided feedback for students' scripts. Then, they updated their scripts.
- **Week 4:** Storyboards of the scripts were manually created on papers by some students. However, others used computer programs. Most used paper drawings.
- **Week 5:** By using software, students chose some visuals such as scene, characters, objects etc. and created their digital stories into digital platforms.
- **Week 6:** They completed creating non-linear stories in digital platforms. The instructor provided feedback for them. Those having some missing parts were asked to complete them for the next week.
- **Week 7:** Students shared their digital stories with their friends and instructor in the computer laboratory.

While creating non-linear digital stories, students were let free to choose a topic, basing on their field of study. It was observed that themes mostly involved secure internet use and computer use ethics. They created stories on these subjects due the problems they hear or encounter in daily life. Students were also free to choose software programs. They mostly designed plain story scenes with trial versions of web 2.0 tools such as Vyond, Storyboard That. For branching structures, they used Adobe Captivate and Adobe Flash etc. software.

Data Analysis

Content analysis method was used for analysing data. Themes, categories, codes and frequencies were determined. Reflection papers of the students and their interview forms were transcribed. Then, these transcripts were coded by two researchers. Reliability co-efficient was calculated by using Miles and Huberman (1994) formula [Reliability = The number of agreed codes / Total number of codes (agreed + disagreed)]. Inter-rater reliability (IRR) was calculated to be 87%. If the IRR is 80% or over, it is considered to be adequate (Miles and Huberman, 1994). In qualitative researches, whereas using tape recorders while recording data and having inter-rater reliability ensure reliability, rich description (describing environment, participants, themes in detail),

long-term participation into the field, and using different and various data sources contribute to validity (Creswell, 2013; Creswell and Miller, 2000; Fraenkel and Wallen, 2008).

FINDINGS

In this study, it is aimed to analyse pre-service teachers' opinions on non-linear digital storytelling. In Table 1, it is seen that semi-structured interview forms and reflections reveal two themes, four categories and twenty-five codes. The Frequency means the number of students for each code.

Table 1. **Opinions of pre-service teachers on the use of non-linear digital storytelling as a teaching method**

Theme	Category	Code	Frequency
Positive Sides	Contribution	Learning new software	10
		Providing different viewpoints	10
		Developing decision making skill	7
		Ensuring edutainment	5
		Learning a new method	5
		Studying skill	5
		Creative thinking skill	5
		Establishing connection skill	3
		Planning skill	2
		Providing various materials	2
	Purposes	Using it in professional life	10
		Ensuring permanent learning	6
		Using it in daily life	5
		Lecturing	4
		Attracting attention	4
		Reinforcement	3
		Arousing curiosity	2
Negative Sides	Challenging Steps	Creating a video	5
		Non-linear script writing	5
	Problems	Technical problems	2
		Being time consuming	2
		Lack of multilanguage support in software	2

When we look at Table 1, it is seen that two categories, "Contributions" and "Purposes", are listed among positive sides of non-linear digital storytelling whereas "Challenging Steps" and "Problems" are presented as two different categories of negative sides.

Contributions Category

This category includes individual benefits of the implementation for pre-service teachers. They stated that it mostly contributed them to learn new software (10), provide different viewpoints (10), and develop decision making skill (7). The pre-service teachers are coded as P1, P2 etc. Some ideas of pre-service teachers on Contributions Category are given below:

P3:…I have learnt the some details in Adobe Captivate such as preparing a slideshow, creating new slides, adding background music or audio records to each slide, and particularly setting a timer for all the records and pictures.

P4: ….It develops the student's decision making skill. The teachers can easily draw their attention to the topics.

P5:… I have learnt how to add new buttons, and learning new features of the program Adobe Captivate has made me happy.

I can use it in different areas. For instance, I could create my own character via free-hand drawing or preparing it in the program Storyboard That. I could add it to Adobe Captivate as a slide and speech balloon, too. Hence, the implementation has contributed me a lot, and I will absolutely be able to practice what I have learned in my future professional life.

Purposes Category

This category includes pre-service teachers' opinions on for what purposes they will be able to use the implementation. It is seen that purposes for use are mostly coded as using it in professional life (10) and daily life (5), and ensuring permanent learning (6). Some of pre-service teachers' opinions on this category are given below:

P3: …. It helps the students learn effectively as it draws their attention to the topic. Teaching with digital storytelling is definitely more memorable. It provides funnier moments for both teachers and students, and also helps teachers teach new things to their students without boring them.

P5:….It was a remarkable experience for me. Movie Maker was also great. We could add the pictures into it. For instance, we could create a video show for one's birthday by adding his/her photos and own audio records. They are all very useful programs. One can easily use them in not only classrooms but everywhere.

P9:…. Preparing a non-linear digital story in Adobe Captivate has provided a remarkable experience for my future career.

Challenging Steps Category

This category includes the steps in which pre-service teachers have faced some difficulties. They stated that creating video (5) and writing non-linear script (5) are challenging steps, having same frequency. Here are some sample opinions of pre-service teachers on this category.

P6: … I had difficulty in using Adobe Captivate since I have never used it before. However, I completed it with a little thought and support with videos from the internet.

P7: … Fictionalization is sometimes a bit hard. I mean connection. Story board is not difficult as you have some ideas about the script.

Problems Category

This category is about the problems that pre-service teachers have during the implementation. In this category, some problems are coded as technical problems (2), lack of multilanguage support for software (2) and being time consuming (2).

P7: …After sign up and account settings, I completed scene and then character selection. Then, I changed the postures, clothes, and colours of the characters clothes' each day. Creating hand and face mimics depending on the scenario is really time consuming for students.

P1: … In addition, I had to look for the meanings of some English words since the software language was English.

P2: …Another problematic situation for me was that I downloaded some sort of background music and tried to add it to the slides. However, it played just in the first slide but not others initially. Then I had to get a hand from my friend and managed to complete my project.

DISCUSSION

In the present study, it is concluded that pre-service teachers have both positive and negative opinions about non-linear digital storytelling. When positive opinions are considered, two categories are foregrounded as personal contributions and purposes of use. Learning new software and providing different viewpoints are listed as the most outstanding contributions. Moreover, they suggested other contributions such as decision making, permanent learning, edutainment, learning new methods, skill development (creative thinking, establishing connection and planning) on study, and providing various materials in teaching. The pre-service teachers have mostly intended to use non-linear digital storytelling both in their professional and daily life. In a similar study, Demirer and Baki (2018) argue that pre-service teachers consider that digital storytelling is entertaining, attractive, provides permanent learning and develops skills, and thus they regard these features as contributions. In their study, Özüdoğru and Çakır (2020) suggest that pre-service teachers state that digital storytelling teaches new methods and provides permanent learning and entertaining. According to findings of Kabaran et al. (2019), pre-service teachers emphasize that digital storytelling affects planning and research skills. In another study by Anilan et al. (2018) conducted with pre-service teachers on digital storytelling, it is emphasized that digital storytelling is entertaining, draws attention, provides permanent learning and can be used in professional life.

It can also be inferred that providing different viewpoints and developing decision making, establishing connection and creative thinking skills are different advantages of non-linear digital storytelling method. Having different points of view is one of the most important skills in non-linear digital storytelling method, particularly in scriptwriting. In non-linear digital storytelling, the scriptwriter needs to use decision making, creative thinking and establishing connection skills effectively while branching the story. There are similar studies in literature which illustrate that non-linear digital storytelling have a positive impact on combining and organising various ideas (Liu et al, 2010), establishing connections and considering different viewpoints (Letonsaari and Selin, 2018), and selecting and making decision (Rasmusson and Bourne, 2017). Maleki and Sajjadi (2012) also conclude that non-linear digital storytelling increases the motivation and participation of students in learning environment. Lange et al. (2019) emphasize that attention, establishing connection and participation are three most important factors for a successful non-linear digital storytelling in education.

When negative opinions of pre-service teachers are examined, two categories are coded as "Challenging Steps" and "Problems". While the former one includes problems regarding creating video and non-linear script writing, the latter includes technical problems, the lack of multilanguage support for the software, and time consuming. There are some studies in literature demonstrating that pre-service teachers have some technical and time aspect difficulties in digital storytelling method (Kabaran

et al., 2019; Özüdoğru and Çakır, 2020; Uslupehlivan et al., 2017). These technical problems might stem from weak infrastructures of computer laboratory. It is also thought that the method is regarded to be time consuming as some of the pre-service teachers do not have much experience, technical problems generally need much time to be solved, learning the software for the first time, the software has no multilanguage support. In addition, creating non-linear scenarios might be a reason for being considered time consuming in this research. Because non-linear storytelling takes more time than linear digital storytelling in both scenario creation and digitization. Creating non-linear stories is pretty complicated and time consuming, but it provides more freedom for both users and creators (Lange et al, 2019).

Being in accordance with constructivism, non-linear digital storytelling has a remarkable importance for professional life development of pre-service teachers. They will be able to practice what they have acquired during their in-service training. Thus, it can be argued that the more effective experiences they get in pre-service, the more successful implementations they have in their professional life. In this study, pre-service teachers produced an interactive educational material via using the technology. In order to use digital storytelling effectively in every phase of education, it is essential for pre-service teachers to be trained on tools and software used in digital storytelling and how to use it in education environments (Uslupehlivan et al., 2017). Thus, it will contribute to training qualified teachers in accordance with the needs of the age.

CONCLUSION AND RECOMMENDATIONS

When findings of the study are analysed, it is concluded that pre-service teachers have both positive and negative opinions on the use of non-linear digital storytelling as educational method. There are two categories in positive opinions: Contributions category and purposes category. While the former has 10 codes, the latter has 7 codes. Under negative opinions, there are also two categories as challenging steps category and problems category. There are two codes in challenging steps category whereas three codes are listed under problems category.

Based on this study, some recommendations can be given to implementers. In this study, some technical and time aspect problems were observed even though it was conducted with 11 pre-service teachers studying at the department CEIT. Thus, it can be argued that there will likely to be many more technical and time aspect problems in more crowded groups or the groups with lesser technological readiness. An adequate infrastructure for computer laboratory and effective technical support will be beneficial for solving these problems. Moreover, more time should be allocated for implementation process. For instance, out of class activities could be added. Pre-service teachers should have training on using software. While implementing non-linear digital storytelling process, restricting the number of branching is also thought to be useful to solve time aspect problems.

Based on this research, some recommendations can be given to the researchers. Different from this research, which was designed as a case study, experimental techniques could be designed and implemented to test impacts of the implementation on educational outputs. Moreover, its practicality could also be tested with pre-service teachers having less technological prior knowledge. As a part of career training, pre-service teachers in other fields could also be trained on non-linear storytelling approach and on software used for this approach. The number of software to be used for creating non-linear digital stories is limited, and many of them have no multilanguage support. Thus, new software with multilanguage support could also be developed.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with 60% contribution of the first author and 40% contribution of the second author.

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