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Reflections of the Teaching-with-Analogies Model (TWA) on the Teaching of Geography[1]

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Abstract

The aim of this study was to reveal reflections of the teaching-with-analogies model (TWA) on the teaching of geography. In this study which was designed based on the qualitative research method, the case study design was used, and a semi-structured interview technique was employed for data collection. In this context, geography preservice teachers were informed about the analogy method and TWA in the course of "Geography Teaching Methods 1." They were divided into four groups, and each group was asked to develop their own TWA model. In the stage of developing the TWA model in a way suitable for the 9th-grade level, the preservice teachers were guided by the instructor of the course, and three field educators, one of whom was also the domain expert, were consulted in order to increase the validity and reliability of the models. Afterward, the model was implemented by the preservice teachers in the internship schools in the framework of the "Teaching Practice" course. At the end of the process, semi-structured interviews were conducted individually with geography preservice teachersFurthermore, according to the geography preservice teachers, 9th-grade students within the scope of the implementation found the TWA model interesting, instructive, facilitating/comprehensible, providing permanent learning, requiring active participation, developing, and entertaining. There were also students who found the TWA model complex and experienced difficulties in understanding the breaking point. Based on these results, it is necessary to introduce the TWA model and analogies to geography teachers and to raise awareness by increasing studies on its usability. Increasing teachers' knowledge and usage skills will reduce their prejudice and limitations.

Keywords: *Geography teaching, teaching-with-analogies model, analogy, geography preservice teacher*

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Analojilerle Öğretim Modelinin (TWA) Coğrafya Öğretimine Yansımaları

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Öz

Bu araştırmanın amacı analojilerle öğretim modelinin (TWA) coğrafya öğretimine yansımalarını ortaya çıkarmaktır. Nitel araştırma yaklaşımına dayalı olarak tasarlanan bu çalışmada görüşme türlerinden olan yarı yapılandırılmış görüşme yöntemi kullanılmıştır. Araştırma kapsamında coğrafya öğretmen adayları "Coğrafya Öğretim Yöntemleri I" dersi kapsamında analoji yöntemi ve TWA hakkında bilgilendirilmiş ve 4 gruba ayrılarak her gruptan kendilerine ait bir TWA modeli geliştirmeleri istenmiştir. 9. Sınıf düzeyine uygun olarak geliştirilen TWA Modeli geliştirme aşamasında öğrencilere dersin öğretim üyesi tarafından rehberlik yapılmış ayrıca modellerin geçerlik ve güvenirliğini artırmak amacıyla alan ve alan eğitimcisi olan 3 kişinin görüşlerine başvurulmuştur. Sonrasında model öğretmen adayları tarafından "Öğretmenlik Uygulaması" dersi kapsamında staj okullarında uygulanmıştır. Süreç sonunda coğrafya öğretmen adaylarına yarı yapılandırılmış görüşme formu uygulanmıştır. Sonuç olarak TWA'nın öğretmen adaylarına çeşitli yönlerde katkı sağladığı ancak coğrafya öğretmen adaylarının modeli geliştirme ve uygulama sürecinde bazı güçlüklerle karşılaştıkları görülmüştür. Meslek yaşantılarında modeli kullanabileceklerini düşünen öğretmen adaylarına göre model birçok derste kullanılabilir. Ayrıca coğrafya öğretmen adaylarına göre uygulama kapsamındaki öğrenciler TWA modelini; ilgi çekici, öğretici, kolaylaştırıcı/anlaşılır, kalıcı öğrenme sağlayan, aktif katılım gerektiren, geliştiren ve eğlenceli bulmuştur. TWA modelini karmaşık bulan ve kırılma noktasını anlamakta zorlanan öğrenciler de mevcuttur. Coğrafya öğretmen adaylarına göre uygulama yapılan sınıflardaki coğrafya öğretmenleri ise TWA modeline 9. sınıf öğrencilerine göre daha eleştirel bakmışlardır. Bu sonuçlardan hareketle coğrafya öğretmenlerine TWA modeli ve analojileri tanıtmak, kullanılabilirliğine yönelik çalışmaları arttırarak farkındalık oluşturmak gerekmektedir. Öğretmenlerin bilgi ve kullanım becerisini arttırmak önyargı ve sınırlılıklarını azaltacaktır.

Anahtar Kelimeler: *Coğrafya öğretimi, analojilerle öğretim modeli, analoji, coğrafya öğretmen adayı,*

Introduction

Geography is a science that deals with the physical and human features, the interaction between people and their environments and seeks to evaluate them in the most efficient way without damaging them (Alaz, 2009, p.4). Moreover, geography helps people to develop independent, multifaceted and creative thinking skills, by using the acquired knowledge in everyday life, and raise awareness of social, cultural and economic issues (Akbulut, 2004, p. 65). In the teaching of geography, it is possible to ensure that individuals acquire the target qualities with the correct planning of learning settings and strategies and realizing the teaching process in parallel to this (Aydın, 2010, p. 817). In this context, especially developed countries leave classical geography education and teaching aside and implement activities-based programs aiming to maximize the geographic skills of students (İncekara, 2007, p.114).

Changes and developments that have occurred with research conducted in recent years on the changing demands of individuals and society, science, technology, learning and teaching approach, theories and strategies have revealed the need to update the curricula of our country. For these reasons, it is aimed to raise individuals, who have high-level cognitive skills, are open to learning and innovations, think analytically, originally and innovatively, question and comment, with the secondary school geography curriculum updated in 2017 to meet the requirements of the age. Moreover, it is recommended to design and implement activities and studies that enable students to associate their newly acquired knowledge and skills with their previous learning (MNE, 2017, p. 5). Indeed, the relationship and similarities between what is already known and what will be learned constitute the basis of the learning process. "Analogies are powerful tools to facilitate the learners' construction process on the grounds of concepts that are already available. The advantages of analogies are due to their significance within a constructive perspective of learning" (Duit, 1991, p.666).

The analogy is defined as "a model drawn from one context and used to support understanding in another context" (Newton, 2003, p.353). A known concept or situation in analogies formed by determining similarities between two concepts or situations and transferring information from the known concept or situation to the unknown concept or situation is known

as the "analog or source" and the unknown situation is called the "target" (Glynn, 1994a, p. 4). Analogies, which are highly effective tools in establishing meaningful connections between what is known and what is tried to be learned (Glynn and Takahashi, 1998, p.1130), reduce the mental load, encrypt the information with shorter codes and, thus, help to keep it in memory for a long time (Bayazit, 2011, p.141). In this context, analogies can be described as educationally powerful tools in the realization of meaningful learning.

In fact, teachers often use analogies for the explanation of complex situations, even when they are not aware of it. It is possible to hear expressions from teachers during a lesson, especially when they respond to students, such as "... is similar to…", "...does not differ from…", "...can be thought as …", and "when … is compared to …". Such explanations are actually different reflections of the phrase "Let me explain the situation with an analogy to you" (Glynn, Law, Gibson and Hawkins, 1994b, p.2), because it is a way of reasoning, and it can be said that analogies are related to the principle of teaching, especially "from known to unknown" (Kemertaş, 2003, p.149). However, this type of use, which is sometimes at a simple level and not deep, can make the method risky and cause misleading. However, the main purpose of using analogies is to provide an understanding of abstract and complex situations with concrete and understandable examples (Heywood, 2002, p.233). In the educational process, teachers use analogies to explain complex situations, although they are not aware of it. In this context, while using analogies, teachers should take into account the prior knowledge of students, increase the number of common features between the selected samples (Cin, 2005, p. 160), specify the points at which the analogy does not work, i.e. dissimilar aspects that can be found between the source and the target, pay attention to the fact whether the source concept explains the target concept correctly (Harrison and Treagust, 1993, p.1292).

In analogies, both the source and the target concept have certain features or sub-concepts, and systematic associations between these two concepts, verbally or visually, are called "analogical mapping" (Glynn and Takahashi, 1998, p.1131). Drawing analogies without any systematic approach prepares the ground for confusion and concept confusion. To prevent this, the systematic use of analogies should be introduced to teachers as a strategy, and

it should be ensured that students learn certain concepts in a meaningful way (Glynn et al. 1994b, p.2).

The "Teaching-with-Analogies Model (TWA)" which forms the basis of the present study and is based on the systematic building of analogies, consists of six stages (Glynn, 1994a, p.13):

1. The introduction of the target concept
2. The reviving of students' memories on the analog situation
3. The identification of the subject-relevant features between the analog and the target
4. The mapping of similarities between the analog and the target
5. The identification of where the analogy breaks down
6. The drawing of conclusions about the nature of the target and making an evaluation

In addition to these six steps, Treagust (1993, p.299) developed a guide that will provide convenience for teachers in the systematic application of analogies. This guide was created as a result of many lesson observations and interviews with teachers, and many teachers easily internalized this guide since it is self-explanatory and concrete on how to be used in teaching. This guide is called FAR. The aim of the FAR guide is to increase the benefits and effectiveness of analogies as much as possible and reduce difficulties and limitations in teaching. The systematic mapping is very important in analogies because while the superficial similarities established are only a clue for students, the systematic mapping between the analog and target provides a deeper understanding and forms the process of transferring information about the analog to the target. Teachers should use the systematic approach in the model of learning with analogies to minimize difficulties that students may experience in realizing the power of relationship and explanation in analogies (Treagust, Harrison and Venville ,1995, as cited in Treagust et al., 1998, p. 87). This guide, of which expansion is "Focus, Action, and Reflection," as is evident from its name, is composed of three steps: The implementation plan, which combines the stages of the Teaching-with-Analogies Model (TWA) with the FAR Guidelines for its implementation, is presented in Figure 1.

As explained in the first sections of the study, the geography curriculum, which was renewed in 2017, adopts the understanding of creating meaningful learning based on associating new knowledge with prior knowledge.

Analogies are also innovative tools that have a positive effect on associating new knowledge with prior knowledge when they are applied within the plan with a systematic approach and that can be used in cases when students experience difficulties in explaining in geography lessons.

TWA MODEL (STEPS)	FAR GUIDE
1. The introduction of the target concept	**FOCUS** This step is the process of preparing students with alternative situations to a situation they are not familiar with, and it covers applications prior to the presentation of the analogy. In this step, the teacher should determine whether students have knowledge of the target and the analog. If the teacher realizes that the analogy will not work in this step, he/she should not try to apply the analogy.
2. The reviving of students' memories on the analog situation	
3. The identification of the subject-relevant features between the analog and the target	***Objective:*** Is the subject planned to be taught difficult? Is it unknown? Is it abstract? ***Students:*** What do they already know about the target subject? ***Analog:*** Is there something students know about the analog?
4. The mapping of similarities between the analog and the target	**ACTION** This step, in a sense, is the process of applying the analogical teaching, and in this section, the presentation of the analogy is performed, similar features between the target and the source in the analogy are mapped, and the breaking points of the analogy are revealed to students, respectively. In this step, the teacher should clearly identify the familiarity of students with the analog situation during the course presentation and whether they have internalized similar and not similar features between the target and the analog. ***Similarities:*** Discuss the characteristics of the analog and target and reveal similarities between them. ***Differences:*** Discuss at what points the analog is not similar to the target.
5. The identification of where the analogy breaks down	
6. The drawing of conclusions about the nature of the target and making an evaluation	**REFLECTION** In this step, following the presentation of the analogy, teachers can further improve analogical mapping by evaluating the clarity and utility of the analogy and results. The evaluation step can be performed in the course or after the course. ***Results:*** Was the analogy clear and understandable or confusing? ***Correction:*** Focus on the previous stages according to the results.

Figure 1. The Stages of the Teaching-with-Analogies Model (TWA) and the FAR Guidelines for Its Implementation. (Adapted from the studies by Glynn, 1994, p. 13 and Treagust, 1993, p.299).

The TWA model strengthened educationally by bringing analogies into a more systematic form is also important for determining the effects of the curriculum by introducing it to the current geography preservice teachers, who will be the implementers of the curriculum in the future, investigating the reflections of contemporary and innovative methods such as analogy on geography education, and raising awareness both in geography educators and program experts. From this point of view, the aim of the study is to reveal the reflections of the Teaching-with-Analogies Model (TWA) on the teaching of geography.

In line with this general aim, answers to the following question were sought in the study:

1. What are the opinions of geography teacher candidates on the use of the TWA model in the teaching of geography?

Methods

This section contains information on the research design, study group, data collection, and analysis.

Research Design

The case study design was used in this study, which was designed based on the qualitative research method. Case studies are a commonly used design in qualitative research. The most prominent feature of the qualitative case study used in this research was the in-depth investigation of one or several cases. In other words, the events and processes related to the case are investigated in detail in this design. In the case study design, the interview technique plays a significant role in data collection (Yıldırım and Şimşek, 2006). In this context, the semi-structured interview technique, one of the interview types, was used in the study. The purpose of the interview technique is to reveal the opinions and feelings of the participants about a particular case (Fraenkel and Wallen, 2008). The semi-structured interview is the process of systematically collecting data from the participants through predetermined questions in order not to go beyond the scope of the study (Berg, 2007). Furthermore, if the answers given in the semi-structured interview are incom-

plete or unclear, it is possible to further clarify the situation by asking questions again (Çepni, 2007). In the present study, semi-structured interviews were conducted with geography preservice teachers to determine the reflections of the TWA model developed in a way suitable for the 9th-grade level on geography teaching settings.

Study Group

The study group of the research consisted of 19 preservice teachers studying in the third year of the Geography Teaching Department at a university in Turkey. In the study, all students studying in their 3rd year at the university were included in the study group. Preservice teachers, all of whom were in the same class, consisted of 11 females and 8 males. The study group was determined based on the convenience sampling method. The convenience sampling method is expressed as the collection of data from a sample that the researcher can easily access (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz and Demirel, 2014). Therefore, the sample of this study was composed of the current preservice teachers studying in the 3rd year at the university and taking the course of Geography Teaching Methods 1 and Teaching Practice. These preservice teachers presented the TWA model they developed within the scope of the teaching practice course to 9th-grade students under the supervision of 4 geography teachers working in 4 different internship schools.

Data collection tools

In the study, a semi-structured interview form was used as a data collection tool to determine preservice teachers' opinions on the use of the TWA model in geography teaching. The data of the study were collected in the next week of the implementation performed by the preservice teachers in the internship schools. Semi-structured interview forms are data collection tools developed to ensure that all dimensions related to the researched questions are covered (Yıldırım and Şimşek, 2006). In this context, there are four questions in the semi-structured interview form applied to geography preservice teachers. No time limit was applied so that the participants would be able to express themselves freely during the interview, and individual interviews

lasting for 15-20 minutes were conducted with preservice teachers. The questions assessed in the findings section in the form of tables are as follows:

1. What are your opinions on the contributions of the TWA model to yourself and your students?
2. What are the difficulties you face during the product development and implementation with regard to the TWA model?
3. How do you plan to use the TWA model in your professional life?
4. What are your opinions on the usability of the TWA model in different disciplines?

Implementation Process

In this study, the geography preservice teachers were first informed about the analogy method in the course of "Geography Teaching Methods 1" in the spring semester of the 2016 – 2017 academic year, and the class consisting of 19 people was divided into four groups, and each group was asked to develop their own TWA model. At the model development stage, the preservice teachers were guided by the instructor of the course, and in order to increase the validity and reliability of the models, three field educators, one being the domain expert at the same time, were consulted. Depending on the criticism and feedback obtained, the model was finalized. Afterward, the model was implemented by the preservice teachers in the internship schools in the framework of the "Teaching Practice" course in the spring semester of the 2017-2018 academic years. During the implementation of the TWA model to 9th-grade students by the preservice teachers, geography teachers were also present in the class and helped the implementation to be performed in a healthy way by guiding the process. At the end of the implementation, an attempt to determine the preservice teachers' opinions on the reflections of the TWA model on geography teaching was made through the structured interview form. The interview was personally conducted by one of the researchers. No time limit was applied during that period, and individual interviews conducted with each preservice teacher lasted for 15-20 minutes. The interview was recorded by a voice recorder by receiving per-

mission from the participants, and then, the recorded data were analyzed through content analysis.

Data analysis

Content analysis was used while analyzing the data collected. The aim of content analysis is to reach concepts and relations that explain the data by processing and coding the qualitative research data and by interpreting them in the framework of certain themes. At the same time, content analysis can be applied to evaluate interview forms (Fraenkel and Wallen, 2008; Yıldırım and Şimşek, 2006). In this study, the semi-structured interview form applied to geography preservice teachers were gathered under certain concepts by performing content analysis. The findings were presented in tables with frequencies, and the examples of the participants' statements were given. For the reliability of the data, the answers were coded by three independent researchers, and the results were compared, and it was observed that encodings compatible with each other at the rate of 86% were performed. In this way, it was ensured that the encodings were performed with consensus, according to a common point of view, without prejudice and misunderstanding.

Findings

This section presents findings related to the research questions.

The findings obtained to reveal the opinions of geography preservice teachers (P) on the TWA model in geography teaching are presented in tables 1, 2, 3, and 4.

Upon examining Table 1 that expresses the opinions of the geography preservice teachers on the contributions of the TWA model to them and their students, it is observed that the preservice teachers stated that this model contributed to them in an individual sense in terms of *"multidimensional thinking," "analogical thinking,"* and *"motivation"*; in professional applications, in terms of *"the use of different methods-techniques," "saving time," "pedagogical content knowledge," and "association between subjects"*; and also at the point of transferring knowledge *"to life," "to different disciplines,"* and *"to*

one's own field" (Table 1). Some of the preservice teachers' explanations about the contributions of the TWA model to themselves are as follows:

P16: *"The TWA model contributed to me in terms of showing to me how I can use an analogy in lessons by making it effective and practical."* P18: *"The TWA model is a model that will help me to draw the student's attention to a lesson even on a boring subject with an analogy, to make the subject clearer in the student's mind and enhance its learning."*

Table 1. The Opinions of Geography Preservice Teachers on the Contribution of the TWA Model to Themselves and Their Students

Category		Code	Preservice teacher (P)	Frequency (*f*)
Related to the preservice teacher	Concerning himself/herself	Multidimensional thinking	1,2,4,8,9,10,19	7
		Analogical thinking (Explanation by analogy)	1,4,12,13	4
		Motivation	1,5,7	3
	Concerning professional applications	The use of different methods and techniques	3,6,10,18	4
		Saving time	7,14,15,16	4
		Pedagogical content knowledge (Making the analogy qualified)	9,16	2
		Association between subjects	4	1
	Concerning the transfer skill	To life	8,12,13,19	4
		To different disciplines	17	1
		To one's own field	11	1
Related to the student		Ensuring effective and permanent learning	2,5,7,8,10,11,12, 13,15,16,17,18,19	13
		Simplification	1,3,6,8,12,14,15, 16,17,18,19	11
		Providing attention, interest, and motivation	1,3,5,6,10,11,12,18	8
		Concretization	4,6,7,11,12,13,17	7
		Internalizing information in a short time	7,14,15,16,18	5
		Association with/use of knowledge in daily life	2,8,12,19	4
		Development of thinking skills	4,9,17	3
		Development of the analogical thinking (Explanation by analogy) skill	5,9,13	3
		Contributing to meaningful learning	11,12	2
		Ensuring students' learning without their being aware of it	12	1
		Encouraging learning	10	1
		Capturing the student's level	10	1
		Association between subjects	5	1

The geography preservice teachers expressed the contributions of the TWA model to their students as follows: *"ensuring effective and permanent learning," "simplification," "providing attention, interest and motivation," "concretization," "internalizing information in a short time," "association with/use of knowledge in daily life," "development of thinking skills," "development of the analogical thinking (explanation by analogy) skill," "contributing to meaningful learning," "ensuring students' learning without their being aware of it," "encouraging learning," "capturing the student's level,"* and *"development of the skill of establishing students relationships association between subjects in students"* (Table 1).

Some of the preservice teachers' explanations about the contributions of the TWA model to students are as follows:

P1: *"The TWA model will provide an easier understanding of the subject, will increase the student's motivation during the learning process and will enable the student to love the lesson."* P12: *"The TWA model prepares the ground for permanent and meaningful learning. The student learns with this model without becoming aware of it, and it becomes more difficult to forget the information since it concretizes the information."* P19: *"Teaching with the TWA model creates permanent learning in the student. With the use of objects, which the student sees in everyday life but to which he/she doesn't pay attention, in the geography lesson, the student becomes convinced that the subject is actually easy."*

Upon examining Table 2, which expresses the difficulties faced by geography preservice teachers during the TWA model development and implementation, it draws attention that most of the difficulties experienced were related to the analogy. The preservice teachers stated that they experienced difficulties during the model development in relation to analogies in terms of: "*determination of the source suitable for the target," "concern about creating a misconception," "finding similar aspects and breaking points of a sufficient number and quality between the source and the target," "not considering breaking points between the source and the target by students,"* and *"generalization of the target to all sources similar to it by students"* (Table 2).

Another area in which geography preservice teachers experienced difficulties during the TWA development and implementation was related to the teaching process. In this category, the preservice teachers stated that they experienced difficulties in the following subjects: *"individual learning difficulties," "concern about making the information more difficult when trying to simplify it," "failure to adapt analogies to each subject in the geography course,"*

"being new and different from classical methods," "not being suitable for every kind of intelligence and not being able to appeal to each student's level," "difficulty in supporting with contemporary methods" and "today's education system problems" (Table 2).

One of the difficulties encountered by geography preservice teachers during the development and implementation of the TWA model was related to available resources. In this category, the preservice teachers stated that they experienced difficulties in the following subjects: *"Time requirement of the TWA model development and the possibility of the model's becoming the loss of time in unnecessary use," "the lack of the literature on the use of the TWA model in geography lessons,"* and *"requiring cognitive effort"* (Table 2).

Some of the geography preservice teachers' explanations explaining the difficulties experienced during the product development and implementation of the TWA model are as follows:

Table 2. The Opinions of Geography Preservice Teachers on the Difficulties They Faced During the Product Development and Implementation with Regard to the TWA Model

Category	Code		Preservice teacher (P)	Frequency *(f)*
Related to the analogy	Determination of the source suitable for the target		1,2,3,4,5,6,7,9,10,11, 12,13,14,15,16,18,19	17
	Concern about creating a misconception		1,2,3,5,6,7,8,11,12,13, 14,15,16,17,18	15
	Finding similar features (Of a sufficient number and quality)		5,7,8,13,17	5
	Finding the breaking point (Of a sufficient number and quality)		8,15,16,17	4
	Not considering breaking points by the student		16	1
	Generalization of the target to similar sources by the student		16	1
Related to the teaching process	Individual learning differences		16,18,19	3
	Concern about making the information more difficult while trying to simplify it		1,13,16	3
	Failure to adapt to each subject		18,19	2
	Being new and different from classical methods		6,19	2
	Not being suitable for every kind of intelligence		14	1
	Not being suitable for each student's level		3	1
	Difficulty in supporting with contemporary methods		8	1
	Today's education system problems		9	1
Related to available resources	Time	Requirement	1,5,8,12,18	5
		Loss of time		
	The lack of the relevant literature		6,10,11,16	4
	Requiring cognitive effort		12,18,19	3

P1: *"At first, I had trouble thinking about whether the subject was suitable for the analogy at the stage of subject selection. Is it possible to explain the subject I have determined with the analogy? Will the student understand it more easily? Or will*

the subject become more complicated? I would say that I was very concerned and troubled about it." P6: *"In the TWA model, it is difficult to try to present the mistake with an analogy, to concretize an abstract concept without sustaining the mistake, to liken it to something else and to create this product because a new, creative and effective product is produced."* P8: *"We experienced difficulties in similarities and breaking points while developing the TWA model because we did not want to create a misconception in the student. The similarities and breaking points we found drew the students' attention. The plan was the subject with which we had the main difficulties. The question of what other techniques we could use in the plan to avoid distracting the student tired us out."* P16: *"The only point at which I experienced difficulties was finding breaking points between the target and the source. While I found similar aspects easily, I experienced difficulties in breaking points because if attention is not paid, the student will think of the target completely as the source and may try to reach a result without considering breaking points. Moreover, if the student tries to adapt the target situation we have exemplified with the source to all elements similar to the source through generalization, he/she can make a mistake."*

As seen in Table 3, most of the geography preservice teachers, with the only exception, stated that they would use the TWA model in their professional life. Upon examining the reasons for use, it is observed that the preservice teachers tended toward the use of the TWA model in the professional life due to its being *"simplifying," "effective in providing permanent learning," "effective in concretization," "different and interesting," "effective in providing meaningful learning," "guiding to high-level thinking," "effective in associating knowledge with life,"* and *"effective in preventing misconceptions"* (Table 3).

Table 3. The Opinions of Geography Preservice Teachers on the Use of the TWA Model in Their Professional Life

Category	Code	Preservice teacher (P)	Frequency *(f)*
Yes, I will use it	Simplifying	3,6,8,12,15,16,18, 9	8
	Effective in providing permanent learning	6,7,12,19	4
	Effective in concretization	6,12,16	3
	Different and interesting	6,12,18	3
	Effective in providing meaningful learning	12,14,16	3
	Guiding to high-level thinking	16	1
	Effective in associating knowledge with life	19	1
	Effective in preventing misconceptions	6	1
I will use it under certain conditions	Depending on the subject	1,2,5,10,11,13,17	7
	Depending on time	1,9,10,11	4
	Depending on the quality of analogy	2,5,9,13	4
	Depending on the student's learning style	11	1
	Depending on the applied education approach	10	1
	Depending on my knowledge	10	1
No, I will not use it	No reason	4	1

Some of the explanations of the preservice teachers who consider using the TWA model in their professional life are as follows:

P12: *"I consider using this model in my teaching life because it is difficult to grasp some subjects of geography and provide permanent learning. It will be an advantage for the teacher to use the TWA model in such abstract subjects."* P18: *"It is a different and interesting model. Although it requires effort and time from the person who prepares it, I will use it because I think it facilitates learning."*

Some of the geography preservice teachers indicated that they would use the TWA model if certain conditions were met. They stated that the use of the TWA model might vary depending on *"the subject," "time," "the quality of analogy," "the student's learning style," "the applied education approach,"* and *"their knowledge"* (Table 3). The explanations of some preservice teachers who considered using the TWA model in their professional life under certain conditions are as follows:

P5: *"I would like to use it, but I don't think I can use it in every subject. Moreover, I will use it when I find an effective analogy, rich in terms of breaking points and similar aspects."* P10: *"It is difficult to implement it completely due to the current educational approach and the inadequacy of the time allocated to the course. However, it may be implemented partially if you have sufficient knowledge."*

As seen in Table 4, one of the disciplines in which the TWA model can be used, according to the opinions of the geography preservice teachers, is

sciences. According to the geography preservice teachers, the TWA model is a model suitable for sciences in terms of the *"suitability of subjects," "having an abstract feature," "having a concrete feature,"* and *"including a lot of concepts"* (Table 4). Some of the explanations of the preservice teachers made about the suitability of the TWA model for sciences are presented below:

P10: *"The applicability of the TWA model in science courses is high. It can be applied in an easy and flexible way in abstract subjects of science courses."* P16: *"The applicability of the TWA model in sciences is high because the targets that are desired to be acquired in this lesson are abstract and concretization is required for understanding."*

The geography preservice teachers stated that the TWA model was suitable for use in geography lessons due to *"the need to concretize abstract subjects," "the presence of subjects difficult to understand," "suitable subjects," "requiring questioning," "suitability to the instructional principles of the course," "being rich in concepts,"* and *"including subjects suitable for misconception."* Moreover, they indicated that the use of the TWA model in geography teaching might vary depending on the *"subject," "purpose," "time,"* and *"the presence of resources that can be used."* Two geography preservice teachers stated that this model was not suitable for the subjects of the geography course (Table 4).

Some of the explanations made by the preservice teachers about the suitability of the TWA model for the geography field are as follows:

P7: *"The TWA model is suitable for the geography course because this course is related to our environment and students have limited access to this environment. Therefore, it is difficult for students to comprehend what is happening in the environment with the cause and effect relationship. I think this model will contribute to a better understanding of geography."* P12: *"Geography is the closest course to the principle of life. However, although the geography course contains subjects from life, we sometimes cannot make students observe these subjects directly. We can ensure more enjoyable, meaningful, and permanent learning by making far information closer with the TWA model."* P15: *"There are many subjects in geography lessons that are difficult to understand, such as the shape and movements of the Earth, plate tectonics. The development of the TWA model for these subjects makes the work of both the student and the teacher easier."*

As can be seen in Table 4, the geography preservice teachers stated that the TWA model could be used in history lessons due to *"containing abstract*

concepts" and *"suitable subjects"* and in social studies lessons *"to make subjects understandable."* Moreover, some of the geography preservice teachers indicated that this model could be used in every field *"as long as there is a suitable subject."*

Table 4. The Opinions of Geography Preservice Teachers on the Usability of the TWA Model in Different Disciplines

Category		Code		Preservice teacher (P)	Frequency (*f*)
Different Disciplines	*Sciences*	It can be used	Suitability of subjects	1,5,9,13,17,18,19	8
			Having an abstract feature	6,10,11,15,16	5
			Having a concrete feature	3,4	2
			Including a lot of concepts	2	1
	Geography	It can be used	The need to concretize abstract subjects	1,6,7,11,12,16	6
			Including difficult to understand subjects	7,14,15	3
			Suitable subjects	3,4,9	3
			Requiring questioning	14	1
			Suitability to the instructional principles of the course	12	1
			Being rich in concepts	2	1
			Including subjects suitable for misconception	6	1
		Conditionally	Varies by the subject	1,4,5,17,18, 9	6
			Varies by purpose	4	1
			If there is time	1	1
			If there is a resource to use	10	1
		It cannot be used	Not suitable subjects	8,13	2
	History	It can be used	Containing abstract concepts	6	1
			Suitable subjects	9	1
	Social Studies	It can be used	To make subjects understandable	17	1
All Disciplines		It can be used in every lesson if there is a suitable subject		1,5,12	3

Discussion and Conclusion

The most important result of the study is that, according to the geography preservice teachers, the TWA model contributes to them and students. Accordingly, the model contributes to the personality of preservice teachers, professional applications, and transfer skills. The TWA model, which has

contributed to the preservice teachers in terms of motivation with multidimensional and analogical thinking, has also brought various gains in professional terms. These gains are the use of different methods and techniques, time management, pedagogical content knowledge, and associating between subjects. The transfer of information to life, different disciplines, and their own field is among what this process has brought to geography preservice teachers. It is observed that the TWA model also contributes to students in addition to contributing to preservice teachers in various ways. This contribution is in the form of providing effective and permanent learning, simplification, providing attention, interest and motivation, concretization, internalizing information in a short time, daily transfer, development of thinking skills, analogical thinking, contributing to meaningful learning, unconscious learning, encouragement, suitability for the level, and associating between subjects. Upon examining the states of using the TWA model by geography preservice teachers in their professional life, it is observed that most of them want to use it. In addition to this result, there are also those who find it applicable if certain conditions are met. There is also a preservice teacher who does not want to use the model, even in a limited way. Upon considering the reasons for using the model, the following can be listed: being simplifying, providing permanent learning, concretizing, being powerful in drawing attention, providing meaningful learning, guiding to high-level thinking, establishing a relationship between knowledge and life, and preventing misconceptions. The usage status may change depending on the subject, duration, quality, individual differences, educational approach, and sufficient knowledge. It is known that the analogy provides great convenience to both the learner and the teacher during the learning and teaching of new concepts, events, and situations (Bilaloğlu, 2005). It is known that analogies support permanent and new learning, draw attention and motivate (Wong, 1993; cited from Gowin, 1993 by: Else, Ramirez and Clement, 2002). There are quite many studies in the literature on the educational power of analogies. The educational benefits of analogies are expressed as follows in these studies: Analogies motivate students by attracting their attention (Şahin, 2010: 302). They help to develop students' cognitive skills (Iding, 1997, p. 240) and facilitate establishing meaningful relations between what they know and what they are trying to learn (Glynn and Takahashi, 1998, p.1130; Mayo, 2001, p.188). They ensure that similar

and different aspects of concepts are revealed and develop the skills of establishing cause and effect relationships and reasoning (Cin, 2005, p.160). By ensuring that students develop an understanding of scientific thinking about a situation, analogies allow new materials, especially abstract situations, to be explained with students' current knowledge (Treagust et al., 1998, p.85).

According to another result of the study, there are some difficulties encountered by geography preservice teachers in the process of the product development and implementation of the TWA model. They are mostly experienced in the analogy development process. These concerns are mostly in the form of identifying the appropriate source in the target-source relationship, not causing an error while doing this, determining similarities and breaking points, and generalizing the target-source relationship. The difficulties encountered in relation to the teaching process are difficulties originating from individual differences, making more difficult while trying to simplify, subject selection, being different and new, suitability to the student's level, support by contemporary methods, and from the current education system, and they may be experienced in the process of the product development and implementation of the TWA model. The development and use of analogies can be difficult for teachers and students if the concept that is desired to be concretized is not well-known (Else et al., 2002). The difficulties encountered in relation to the available resources were explained with emphasis on time management, the lack of literature, and requiring cognitive effort. Analogical thinking is the shining face of the TWA model. There is also a dark side. When students overgeneralize and map noncorresponding features of concepts, misconceptions can emerge (Cited from Thagard, 1992 by: Glynn, 1994). Analogies should be used with caution, or they can mislead learners and make learning ineffective. Children can focus on an irrelevant aspect of the analogy to produce results similar to the target content (Cited from Parida and Gosvvami, 1998 by: Bilaloğlu, 2005).

The geography preservice teachers found the TWA model applicable in different disciplines. It was concluded to be applicable in sciences, geography, history, social studies, and partially in all disciplines. It was found suitable in sciences in terms of suitability of subjects, abstract and concretizing features, and by considering the concepts it includes. Since geography includes subjects that are difficult to understand due to the need for concreti-

zation, it was found suitable because of suitable subjects. In addition to these, it was also evaluated with the aspects of requiring questioning, compliance with instructional principles, having a rich conceptual structure and a content suitable for misconceptions. However, there are preservice teachers who think that the model can be applied under certain conditions in geography teaching. They emphasized important points such as subject selection, purpose, time management, and resource provision as the reasons for this. The preservice teachers explained the applicability of the model in history lessons by the presence of suitable subjects containing abstract concepts. In social studies, the TWA model was found to be applicable in terms of comprehensibility. Studies in the literature are mostly in the field of sciences.

The geography preservice teachers, in general, have positive observations on students in the class where they have implemented the TWA model. The students found the model interesting, instructive, facilitating, and comprehensible, providing permanent learning, requiring active participation, developing, and entertaining. It is known that analogies support permanent and new learning, draw attention, and motivate (Wong, 1993; cited from Gowin, 1993 by: Else et al., 2002). There are also students who find the TWA model complex and experience difficulties in understanding the breaking point. It is thought that these negative observations will decrease with the active participation of students in the production process because learners need to produce analogical information by themselves in order to understand new information better. Thus, the child will become active in the learning process and may develop his creative thinking competencies, and learning may become more interesting, effective, and easier (Kutlu, 1999; cited from Şahin, 2000, p.43 by: Bilaloğlu, 2005). As in any model, method, and technique, the TWA model also has its advantages and limitations. It is observed that teachers, rather than preservice teachers, have emphasized these deficiencies and limitations. Namely, the negative opinions of the geography teachers in the class where the geography preservice teachers have performed an implementation are more than positive opinions. The teachers evaluated the model as time-consuming, being above the student's level since it appeals to high-level cognitive steps, being not suitable to the education system and school conditions, challenging, misleading, costly and inadequate in drawing students' attention. The development and

use of analogies can be difficult for teachers and students if the concept that is desired to be concretized is not well-known (Else et al., 2002). Apart from sethese negative aspects, being beneficial, instructive, effective in misconceptions, easy, ensuring permanence, and time-saving are among the positive results of the study. Analogies should be used with caution, or they can mislead learners and make learning ineffective. Children can focus on an irrelevant aspect of the analogy to produce results similar to the target content (Cited from Parida and Gosvvami, 1998 by: Bilaloğlu, 2005). The teachers' teaching habits and the fact that they encounter the model and the method for the first time may underlie these opinions. The statements of cost and being unsuitable to the system are statements that support this result.

Recommendations

It is necessary to introduce the TWA model, analogy, and other simulation techniques in geography teaching to geography teachers, raise their awareness by increasing studies on its usability. Increasing teachers' knowledge about the technique and their usage skills will reduce the disadvantages and limitations of the technique. For this purpose, the participation of geography teachers and preservice teachers in congresses and symposiums at which various methods and techniques are introduced in practice can be encouraged.

In studies conducted at different levels and with larger study groups, the effect of different independent variables can be tested. In other studies to be conducted to examine the effectiveness of the TWA model in the geography course, it can be compared with other teaching models.

Textbooks and curricula can be analyzed in terms of analogical thinking skills. This is also important in terms of giving an idea to education experts working in the field of geography education and raising awareness of the TWA model.

The kind and quality of analogies produced by teachers and students while guiding them in producing analogies may be analyzed. By creating analogical databases, course materials, such as EBA, can be opened to sharing by storing practical examples in their storehouses. Its effectiveness can

be discussed on the same sharing tools. Likewise, the course materials that develop analogical thinking skill can be included in learning object pools.

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