

**Research Article**

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## Discovery Learning Strategy in Geographical Education: A Sample of Lesson Design

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### Abstract

The practice and activity examples are quite limited regarding how the learning-teaching processes, which are offered by the teaching program of geography lesson prepared in 2005, updated in 2011 and amended comprehensively in 2017, can be achieved. There is not any teachers' guide analyzing the teaching program's approach and how it should be conducted is available in this matter, indeed. For this reason, the application of the program is completely under the initiative of teachers. This research aims at analyzing the discovery learning strategy, one of the strategies made use of in geography teaching, preparing an example lesson plan as to how the discovery learning strategy can be transferred to classrooms and developing suggestions in order to fill the gap in the literature even a little and increase the number of model applications. The reason why the discovery learning strategy is chosen in the research is the fact that it is in compliance with the student-centered approach proposed by the geography teaching program in effect because it is essential in the discovery learning strategy that students are centered and teachers act as guides. The research was conducted by means of descriptive analysis method. Within this frame, the discovery learning strategy was examined; the importance of planning the teaching activities was explained and a lesson template was created. With reference to the mentioned template; a lesson plan example based on the subject "Interior Structure of the Earth" was prepared in order to offer an example regarding how the discovery learning strategy can be moved to classrooms. The research results are anticipated to be useful for geography and other branch teachers and to constitute a basis for prospective academic studies.

### Keywords

Discovery Learning Strategy, Geography Teaching, Lesson Plan, Interior Structure of the Earth

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How learning is actualized has been one of the issues discussed by the researchers for long years. Like many other issues; there are different views on how the learning is actualized in today's world which is changing rapidly due to the effect of globalization. Bruner's discovery learning and Ausubel's expository teaching, research-examination learning and peer learning (cooperative learning) strategies explain how teaching should be practiced. Included in these developed learning strategies; methods such as explanation, discussion, demonstration; problem solving, question-answer, simulation, travel-observation, project, six thinking hats are commonly used in geography teaching (Çakmak, 2015, p. 437-462; Özerbaş, 2016, p. 192-229; Cengizhan, 2016, p. 223-256).

Developed by J.S. Bruner, the discovery learning strategy is a motivating learning strategy actualized based on students' own activities and observations. Unlike the demonstration method; the discovery learning strategy arranges a learning environment based on students' efforts instead of presenting the information to students. Bruner states that students are required to think like scientists; and instead of presenting the concepts and principles, they must be directed to make research and experiments, find out concepts and develop analysis and synthesis abilities (Bruner, 1961, s. 1-9: Senemoğlu, 2015, p. 465).

Initiating the teaching activities without making a proper planning in geography lessons prevents teaching activities from being implemented in a productive way. For this reason, geography lessons must be planned in advance and lectured accordingly (Doğanay, 2014, p. 362-363; Öztürk, 2010, p. 52-53). By this way, lessons can be covered productively and an environment can be achieved for sustainable learning.

Examining the relevant literature; it can be seen that the studies as to how discovery learning strategy can be applied and planned in geography lessons are limited. Primary studies as to how the discovery learning strategy should be used in geography lessons are: Doğanay and Zaman (2002); Artvinli, Kılıçaslan and Bulut (2003); Tomal (2004); Karakuş (2007); Tokcan and Oruç (2009); Ünal (2012); Aydın and Güngördü (2015); Kocalar and Demirkaya (2017); Şeyihoğlu and Geçit (2018).

Doğanay and Zaman (2002) state that it may be beneficial that students are directed to discover with simple homeworks in terms of collection of some data in geography lessons. Artvinli et. al, (2003) in their research concluded that geography teachers do not have the effective teaching and lecturing abilities in general. Tomal (2004) concluded in his study that the writing method is applied to significantly by geography teachers in secondary education. Karakuş (2007) highlights the importance of experiment method in geography teaching in his study and explained the wind formation by means of the experiment method having concluded that students can learn in the geography lesson by means of the discovery learning method by exploring information, experiencing and doing. Tokcan and Oruç (2009) focused in their study on the development regarding geography teaching in the Ottoman Empire in the 20<sup>th</sup> century and set light on the current geography teaching by presenting a lesson plan prepared according to the discovery learning strategy. Ünal (2012) states in his study that the use of discovery learning in geography ensures meaningful learning and is applicable. Aydın and Güngördü (2015) explained the attributes of the teaching

strategies used in geography teaching such as demonstration, discovery and research-examination and presented a lesson plan based on the discovery learning strategy. Kocal and Demirkaya (2017) concluded in their study that the demonstration is the strategy used by geography teachers the most while discovery learning is one of the least used strategies. Şeyihoğlu and Geçit (2018) explained in their study the characteristics of the discovery learning strategy and prepared the lesson plan with regards to the parallels and meridians subject included within the curriculum for 6<sup>th</sup> graders in accordance with the discovery learning strategy.

The purpose of the study is to analyze the discovery learning strategy which is one of the learning strategies used in the geography lesson (Ünal, 2012, p. 358; Aydın and Güngördü, 2015, p. 23; Ünlü, 2014, p. 82; Doğanay, 2014, p. 199) and to prepare a sample lesson plan regarding how this strategy can be applied in classes and to develop suggestions. Studies in the available literature directly aiming at teaching geography based on the discovery learning strategy are limited. The study is thought to contribute to similar studies to be conducted.

## Theoretical Framework

### Discovery Learning Strategy

Also known as the exploration learning strategy; discovery learning is a learning strategy developed by Jerome Bruner in 1960s. Discovery learning is a learner based learning strategy encouraging students to reach a conclusion based on the activities and observation (Table 1).

Table 1

*Characteristics of Discovery Learning Strategy* (Kara and Özgün-Koca, 2004, p. 9).

<b>Discovery Learning</b>	
<b>Highlight</b>	Discovery
<b>Main Objective</b>	Discovery of information
<b>Building Information</b>	Connection with preliminary information
<b>Activeness</b>	Active students
<b>Process</b>	Reasoning (From example to rule)
<b>Means</b>	Condition
<b>Communication</b>	Peer learning
<b>Among Students</b>	
<b>Time</b>	May take some time
<b>Transfer</b>	Important
<b>Learning</b>	Diligently arranged and structured: Tips and examples
<b>Environment</b>	

Discovery learning strategy is a motivating strategy that is accomplished based on the students' own activities and observation. Unlike the demonstration strategy, this learning strategy (Table 1) arranges a learning environment which bases on students' efforts rather than presenting information to students. Having developed the discovery learning strategy, Bruner states that students are required to think like scientists. Bruner highlights that students need to be directed to making research and experiments and

finding concept rather than concepts and principles being given to students (Bruner, 1961, s. 1-9; Bruner, 1966, s. 10-11; Arslan, 2016, s. 191; Arslangilay, 2016, s. 180; Gökalp, 2017, s. 23; Mayer, 2004, s. 15).

### **Importance of Planning Teaching Activities**

Teaching-learning at schools is accomplished based on a process composed of planning, application and evaluation stages. Working in a planned way is one of the most effective ways of achieving the pre-determined goals of teachers. One of the most important factors affecting the success of teachers in teaching is the preparation made before classes. Planning teaching activities for the lesson to be covered is one of the most important activities that a teacher is supposed to do before his/her lessons.

## **Methodology**

### **Design of the Study**

The research was conducted by means of the cross-sectional, descriptive analysis and document analysis methods. The descriptive research can be defined as what is being experienced is described by those experiencing and revealing them. Ongoing phenomena are researched instead of the incidents that took place or ended. In descriptive researches; no actions are taken to control the natural and social incidents which are worked on. The researcher does not intervene with the incidents or add any variables into the environment to change the flow. He/she makes his/her research as the phenomenon or the incident functions without intervening (Sönmez and Alacapınar, 2016, p. 47-48).

Data acquired in the descriptive analysis method is summarized based on the pre-determined subject and presented to readers after being interpreted and organized. Data acquired is primarily explained in a logical way and some results are revealed with the cause-effect relations being searched. The researcher makes future predictions by associating and interpreting the subjects (Yıldırım and Şimşek, 2000, p. 158-159).

In cross-sectional descriptive analysis studies; objects are selected among the groups representing the universe and they are worked on (Christensen, Johnson and Turner, 2015, p. 51; Sönmez and Alacapınar, 2016, p. 47; Turan, 2016, p. 53). For instance, while analyzing the question “What are the problems and trends among geography teachers in Turkey?”; geography teachers with the characteristic to represent the universe from Turkey are selected instead of selecting all the teachers and a result is obtained by taking their opinions. Making use of the cross-sectional descriptive analysis method in the study; objects representing the universe were selected; and making use of the demonstration technique and following the structured discovery steps (using a middle-sized potato, pencil, knife, scissors, napkin, poster paint, toothpick, an A4 paper and adhesive) mockups of layers forming the interior structure of the Earth are requested to be created.

Basing on the visual, audial, statistical and written proof remaining from social phenomena; document analysis method can be used both as an auxiliary method in terms of education science researches and as a primary method through which the

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research is maintained (Ulutaş, 2015, p. 279-284). The document analysis method, which is conducted by written and visual document collection and examination, can be made use of in qualitative and quantitative researches (Sönmez and Alacapınar, 2016, p. 108). Under conditions where direct interview and observation cannot be accomplished; the document examination may be applied to (Bowen, 2009, p. 28).

The study in question seeks an answer to the question “*Can a lesson plan be prepared so that the discovery learning strategy can be applied in geography lessons?*”.

The literature review that we performed within the frame of the question “Which teaching strategies are used in Geography teaching?” shows us that the methods used include demonstration strategy, discovery learning strategy, comprehension (Gestalist) learning strategy, latent (sign-hidden) teaching strategy, research-examination teaching and peer teaching strategy (Akınoğlu, 2004, p. 82; Akbulut, 2004, p. 66; Artvinli, 2010, p. 191; Demiralp, 2007, p. 379; Doğanay and Zaman, 2002, p. 14; Kocalar and Demirkaya, 2017, p. 337; Ünal, 2012, p. 348; Ünlü, 2014, p. 81-136; Şeyihoğlu and Geçit, 2018, p. 84-102; Öztürk, 2004, p. 79)

Having used the key words within the scope of the study such as “Geography teaching, geography teaching methods, discovery learning and geography teaching, geography lesson plan”; academic studies based on the application of discovery learning strategy in geography lessons were scanned through the online Higher Education Council National Thesis Center. As a result of the scan; 110 publications were determined; performed between 1988 and 2017 regarding the geography teaching and learning registered in the National Thesis Center of the Higher Education Council. However, none of these publications directly targeted the implementation of the discovery learning strategy in the geography lessons.

## Findings

### A Lesson Plan Sample Based on Discovery Learning Strategy

The lesson plan is composed of the introduction, development, conclusion and evaluation (empowerment) steps. A lesson plan basing on the interior structure of the Earth according to the discovery learning considering these steps is presented in the Table 2.

Table 2

*Figural section of the lesson plan based on the subject interior structure of the Earth*

<b>Figural Section</b>	
<b>Name of the Lesson</b>	Geography
<b>Grade</b>	10
<b>Unit Name</b>	Natural systems
<b>Name of the Section:</b>	Tectonic Formation and Interior Structure of the Earth
<b>Name of the Subject</b>	Interior Structure of the Earth
<b>Time:</b>	40 + 40 minutes
<b>Teaching-Learning Strategy</b>	Discovery learning strategy
<b>Teaching-Learning</b>	Question-answer, demonstration method

<b>Technique</b>	Images and pictures showing the interior structure of the Earth, globe-like middle-sized potato, pencil, knife, scissors, napkin, poster paint, toothpick, an A4 paper, adhesive (preferably plaster, play dough, mud etc. can be used), board, chalk, textbook)
<b>Source and Tools</b>	
<b>Subject pattern</b>	Definition of the layers forming the Earth topography; characteristics of the crust, mantle and core; ability to give examples among the objects similar to the interior structure of the Earth.
<b>Sub-titles</b>	1. Crust, 2. Mantle, 3. Core
<b>Main point</b>	The interior structure of the world is composed of three layers; crust, mantle and core.
<b>Auxiliary points</b>	Layers forming the interior structure of the Earth have similar and different characteristics. <b>1.</b> Ability to figure out that the Earth interior structure is composed of the crust, mantle and core. <b>2.</b> Ability to discover that the average thickness of the crust is 70 km and thicker in the terrain and thinner in ocean bottoms. Ability to figure out that the crust is divided into two; Sial and Sima; to discover that the crust is divided into two, oceanic and continental; that the volume of the crust constitutes approximately 1% of the Earth's volume and 4% of the Earth's weight. <b>3.</b> Ability to discover that the mantle's volume constitutes 84% of the Earth's volume and two-thirds of the Earth's weight; is located in between 70 km and 2900 km; and that in between the crust and mantle is the asthenosphere transition layer. <b>4.</b> Ability to find out that the core forming the ground structure has a radius of 3470 km in the Earth center and is located in between 2900 and 6378 km; that the core is divided into two, interior and exterior; that the outer core has a radius of 2250 km while the interior core's radius is 1220 km; that the rocks are melted due to the high temperature in the outer core, the density of which differs from 5,5 gr/cm <sup>3</sup> to 10 gr/cm <sup>3</sup> ; in the interior core, the density and temperature of which is 13,6 gr/cm <sup>3</sup> and 6000°C respectively, rocks are crystallized due to the high pressure; that the volume of the interior and exterior core makes up 15% of the Earth's volume and 32% of the Earth's weight. <b>5.</b> Ability to discover that the temperature and density increase from the crust towards the core. <b>6.</b> Enhancing the geography questioning, developing the geographical observation abilities, acquiring the ability to prepare and interpret tables, graphs and diagrams.
<b>Target Behaviors (Acquisitions)</b>	

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**Introduction activities.** In the introduction part of the lesson, the teacher prepares the students for learning by giving them a general perspective about the lesson to be covered. Attention getting, motivation, reviewing and transition to the lesson are the steps of the introduction.

**Attention getting.** These are the activities to be carried out to allow the students to focus on the subject to be covered. In this part; open-ended questions may be asked to arouse curiosity about the subject; or activities such as telling relevant stories or jokes or displaying relevant images or materials can be carried out. The teacher is required not to state whether the answer is right or wrong or provide any reinforcers (Sönmez, 2015, p. 108; Bayat, 2016, p. 352; Tanrıseven, 2016, p. 59). The teacher may grab attention by saying “Today we are going to cover the subject; the structure of the Earth”. Students are provided summary information such as the fact that the Earth is composed of three layers; crust, mantle and core (Figure 1). The teacher can start covering the subject by writing the interior layers of the Earth on the board and ask the question to students “Is there anyone who has any idea about the subject?”. Some students may give answers such as earthquake, volcano, orogenesis, atmosphere, troposphere; in which case students are told earthquake, volcano, orogenesis, atmosphere and troposphere are not the interior layers of the Earth and the subject continues to be covered without giving any positive or negative reinforcers so that they can find the answers out themselves.

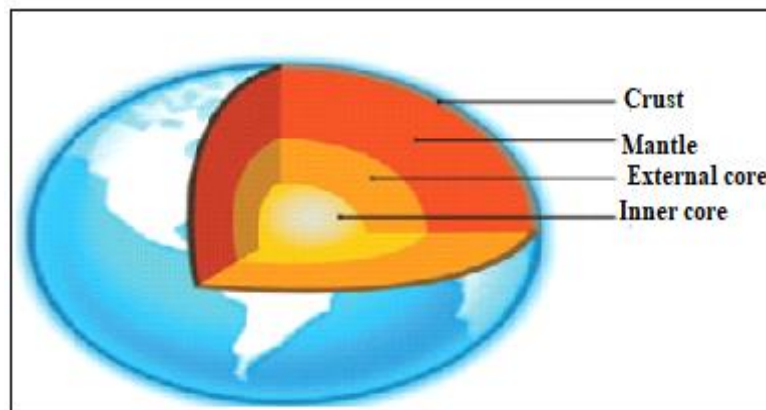


Figure 1. Interior Layers of the Earth (Tekbaş, Ekiz and Aydın, 2015).

**Motivation.** Motivation means the importance of the subject to be covered is highlighted for students. A motivating discussion environment is created regarding the subject to be taught by the initiative of the teacher. The teacher explains and highlights why the abilities to be acquired in this lessons matter in the upcoming lessons or why they are required to overcome the problems in their lives by giving examples (Sönmez, 2015, p. 296; Kayabaşı, 2015, p. 491). The teacher motivates students by saying “*If you are able to acquire the abilities in this lesson, you can easily solve the problems regarding the interior structure of the Earth*”.

**Review.** At this stage; the teaching activities decided to be implemented during the lesson and the teaching objectives aimed to be acquired by students are presented. It is; thus, highlighted which information and to what extent students will learn throughout

the lesson. (Sönmez, 2015, p. 296; Taşdemir, 2015, p.140). The teacher reviews by saying “You will learn that the interior structure of the Earth is composed of three main layers (Figure 1, 2, 3; Photograph 5 c, d, e, f) and learn their characteristics”.

**Transition to the lesson.** At this stage, the teacher is required to start the transit to the lesson by giving examples about the subject and have student carry out other activities (Sönmez, 2015, p. 109; Bayat, 2016, p. 352). After the teacher saying “Now I will show you the layers constituting the interior layers of the Earth (Figure 1, 2, 3) and then you will need to draw them on your notebooks”; the teacher reflects the shape on which the interior layers of the Earth are displayed on the board; followed by the development stage.

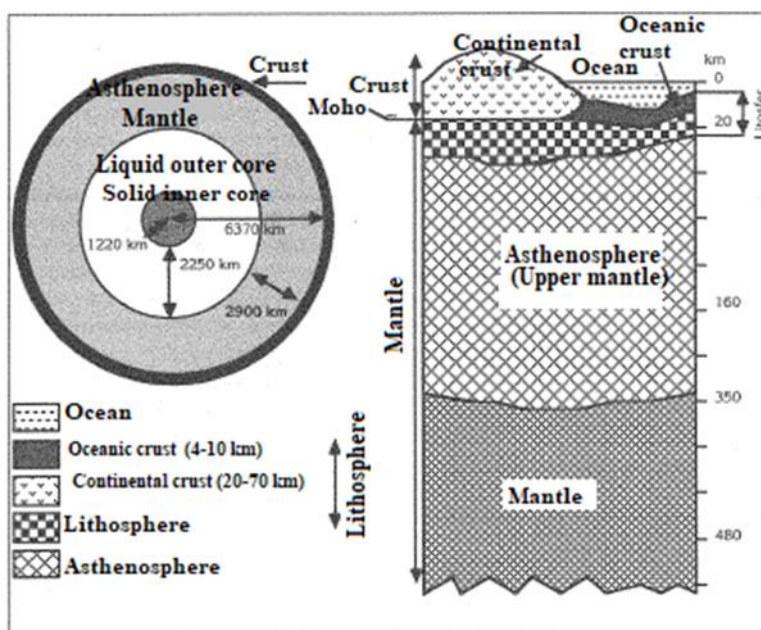


Figure 2. Earth's structure and state of layers on the crust (Atalay, 2012, p. 134).

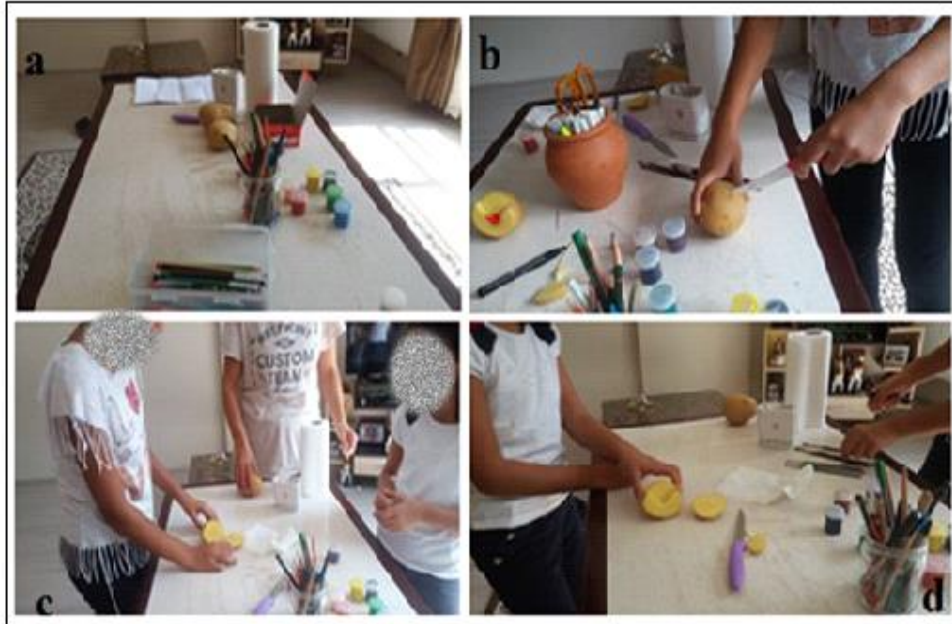
**Development stage activities.** The development stage of the lesson plan is the stage at which students gain the aimed acquisitions. The strategy complying with the acquisitions, equipment, tips, feedback-corrections, and reinforcers are utilized by ensuring the participation of students. 20 to 25 minutes of the lesson is spared for this part in planning. The teacher is required to write the activities planned to be carried out in this stage in an order. The interim summary and evaluation activities may also be included in this step (Sönmez, 2015, p. 110-111; Bayat, 2016, p. 352). Within this scope, the strategy, method and techniques to be followed to develop the teaching objectives to be presented in geography lessons are implemented in this stage of the lesson.

After theoretical information regarding the interior structure of the Earth is presented; small groups of students (2-3 students) are formed. Then, the following steps are to be followed by means of the demonstration method (For instance; showing Figure 1) and students are requested to create mockups of the layers forming the structure of the world. Each group is requested to create the mockups of the layers forming the



interior structure; crust, mantle and interior and exterior cores by using a Globe-like, middle-sized potato, pencil, knife, scissors, napkin, poster paint, toothpick, an A4 paper and adhesive (with a Photograph 1a).

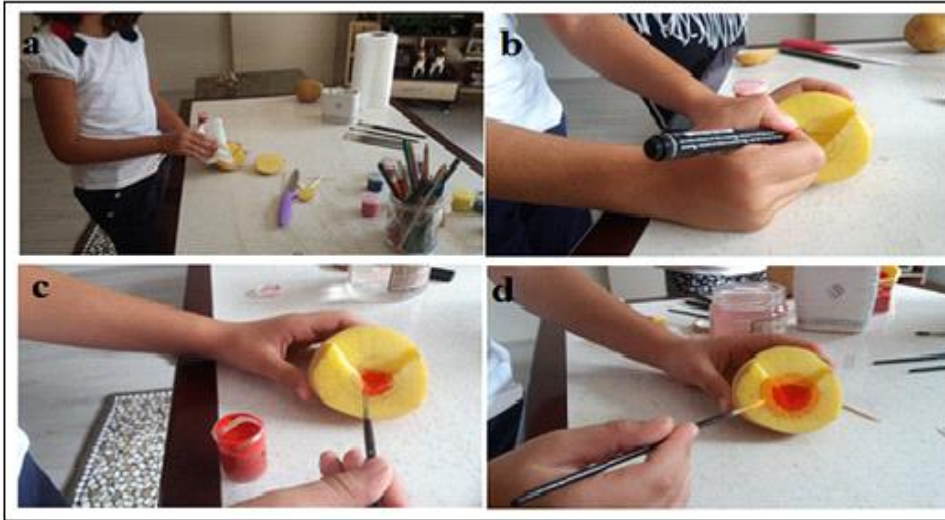
1. Mockups of the layers forming the interior structure; crust, mantle and interior and exterior cores are created by using a Globe-like, middle-sized potato, pencil, knife, scissors, napkin, poster paint, toothpick, an A4 paper and adhesive (with a Photograph 1a).



Photograph 1. Necessary equipment to display the interior layers of the Earth.

2. The potato is divided into two with a knife (Photograph 1 b, c, d). The knife must be used carefully under the control of the teacher. The potato cut by the knife is dried (Photograph 2a). This activity refers to “*the Actional period*”, one of the cognitive development periods of Bruner.

3. After the cutting is done; the Earth’s layers are drawn by taking the boundaries and thicknesses into account (students may be given freedom to determine the order of drawing layers to allow them to be realistic) on the potato mold. It is paid attention that the thinnest layer of the crust, the thickest layer of the mantle and the outer core are bigger than the interior core (Photograph 2 b, c, d). This activity refers to “*the Imagnate period*”, one of the cognitive development periods of Bruner.



Photograph 2. Drawing the boundaries of the Earth's layers on the potato mold.

4. After process of drawing the interior layers of the Earth is completed, each layer is painted in different colors (students may be given freedom to select the color of layers) (Photograph 2 c, d; 3 a, b, c, d). By means of this activity, it is switched to “the Symbolic period” of Bruner.



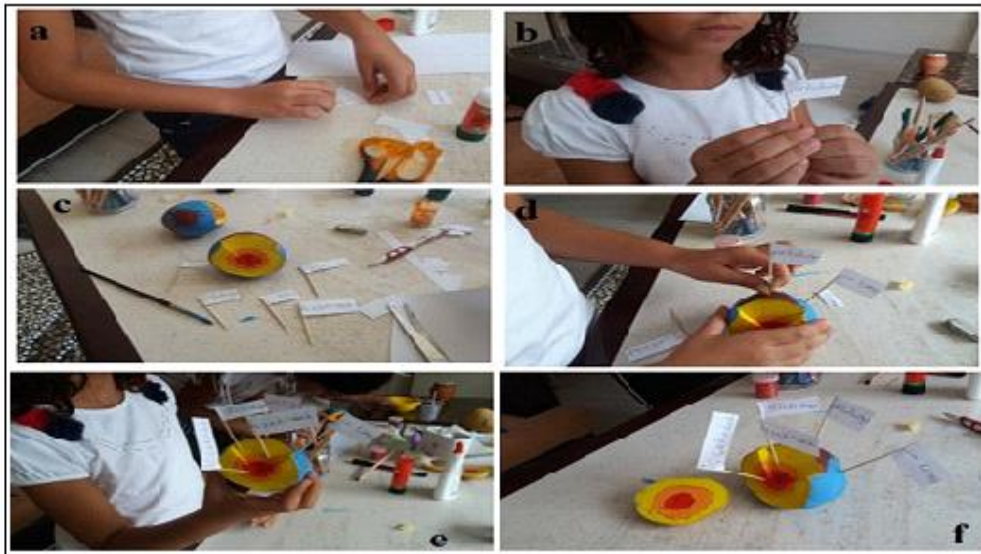
Photograph 3. Painting layers in different colors.

5. After the paints dry, names of each layer is written on an A4 paper. Name flags of each layer are attached to the toothpicks cut by scissors (Photograph 4 a, b, c, d; 5 a, b).



*Photograph 4.* Writing the names of the layers.

6. The activity is completed after toothpicks are positioned in the potato mold and a representative small mockup of the Earth is created (Photograph 5 a, b, c, d, e, f).



*Photograph 5.* Positioning the names of the Earth's layers onto the potato mold.

A planned and systematic geography lesson where the discovery learning strategy is emphasized and the teacher directs learners with instructions and tips is covered by this way. An active and collusive teaching is implemented by means of such activities and students are allowed to acquire information by discovering. Students can; thereby, pay attention to the lesson, develop their problem solving abilities and enhance high level cognitive abilities since they participate in the lesson actively.

**Closure stage.** The closure stage includes the final summary, re-motivation and closure activities.

**Final summary.** The acquisitions can be summarized at different times. After all the auxiliary ideas are explained during the “*final summary*” provided at the end of the lesson, the “*main point*” should be explained. Repetition of the main and auxiliary ideas during the interim and final summary may cause the behavior to be permanent and help students rectify their deficiencies and correct their mistakes (Sönmez, 2015, p. 312; Taşdemir, 2015, p. 142).

The teacher by taking the aforementioned descriptive information provides the generalization that the Earth structure is composed of the crust, mantle and core and explains that the crust is the uppermost layer of Earth’s surface and its average thickness is 70 km; and it is thicker on the terrain while being thinner on the oceans. The teacher explains that the crust makes up approximately 1% of the Earth’s volume while constituting 4% of its weight; and the mantle is located in between the crust and the core and constitutes 84% of the Earth’s volume while constituting two-thirds of the Earth’s weight. The teacher also states that the core has a radius of 3470 km in the center of the Earth (Figure 1, 2, 3; Photograph 5 c, d, e, f) and that the core is divided into two as the interior and exterior core and the radius of the exterior core is 2250 km while the radius of the interior core is 1220 km by adding that the volumes and weights of the exterior and interior cores constitutes 15% and 32% of the Earth’s volume and weight, respectively, and the temperature and density increases from crust towards the interior core by making use of the Figure 1, 2, 3 and photograph 5 c, d, e, f. The teacher wraps up by saying “*By this way, we have learnt the characteristics of the layers forming the structure of the Earth by doing and experiencing*”.

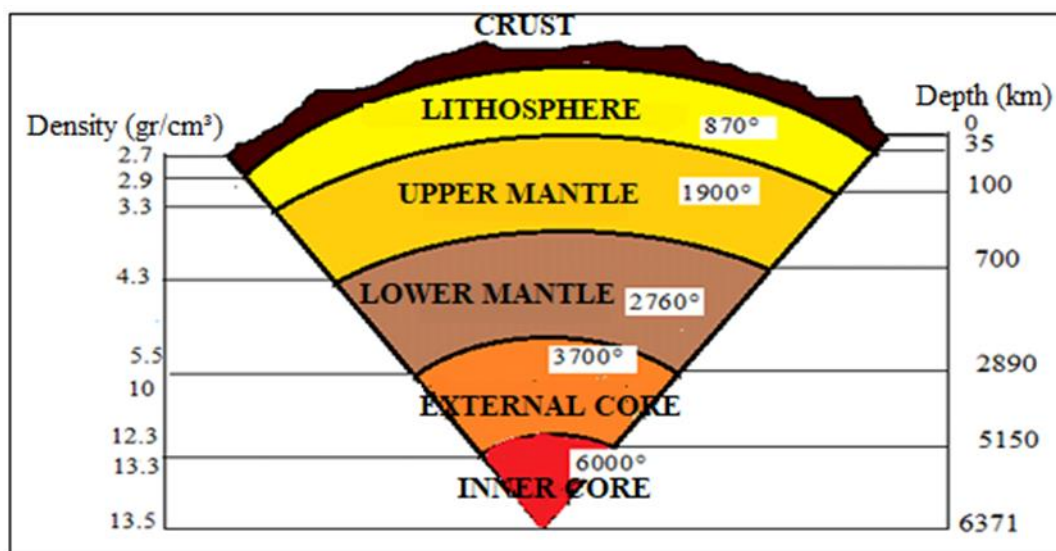


Figure 3. Interior layers of the Earth (Adapted from Erinç, 2000: 110-116; Atalay, 2012: 133-134).

**Re-Motivation.** The students are re-motivated at this stage in order to ensure the continuity of their interest in learning. The stage is a step where students can realize

once again the importance of the behaviors they are wished to gain. Additionally, behaviors gained in the previous lesson may increase the importance of motivation if they are prerequisite for the next lesson (Sönmez, 2015, p. 312; Taşdemir, 2015, p. 142; Tanrıseven, 2016, p. 60).

**Closure.** At the stage, the teacher should repeat the open-ended questions he/she asks at the attention getting stage. Additionally, the lesson should be ended with practices such as making students aware of, if any, the result of an unfinished activity; being told a joke or story, being encouraged to probe into an event or phenomenon etc. Unless students are able to answer the questions despite all these activities; feedback and correction should be applied to. If right answers still cannot be obtained, the teaching must be reorganized (Sönmez, 2015; Taşdemir, 2015; Bayat, 2016).

**Evaluation.** Evaluation activities must be included at the end of the teaching activities no matter what the time or quality of the teaching activity is. The assessment and evaluation activities are generally advised to be applied to before the summarization at the latest steps of lessons. At this stage, the teacher is required to ask at least one question about each behavior students are wished to acquire. 5 or 10 minutes before the end of the lesson, the teacher should make an evaluation regarding shaping and education and students should not be scored. This way, the teacher can carry out corrective and supplementary activities. (Ekşioğlu, 2016; Senemoğlu, 2015; Sönmez, 2015; Taşdemir, 2015).

The geography lesson teacher should pay attention to the aforementioned considerations and prepare and address following evaluation questions (or similar ones) regarding “the interior structure of the Earth” at the end of the teaching.

Question 1: Please explain why the crust, which forms the interior structure of the Earth, is thinner on oceans and thicker on the terrain.

Question 2: Please explain the characteristics of the mantle.

Question 3: Please explain why the core is called nife and why the interior core is solid while the exterior core is melted.

Question 4: Please write down the percentages of the layers forming the interior structure of the Earth within the volume and weight of the Earth.

Question 5: Please explain why the temperature and pressure increase from the crust towards the core.

## Conclusion and Discussion

Within the scope of this study, the application process of the discovery learning in geography lessons was analyzed. An activity based on the discovery learning strategy was conducted within this frame and a lesson plan template was developed. Additionally, it was analyzed whether academic studies basing on the application of the discovery learning strategy in geography lessons were conducted or not.

In the study, the focus was on a planned and systematical geography lesson lecturing by means of the structured discovery (Senemoğlu, 2015, s. 468; Kula, 2015, s. 336) where the teacher directs learners with instructions and tips. An active and collusive learning environment was; thereby, accomplished and learners were allowed to acquire knowledge by experiencing and discovering. The activities presented to this end

allowed a learning environment based on experiencing and discovery. Activities conducted within the frame of the study caused students to participate in the lesson actively and pay attention to the lesson. Students were reinforced to develop their problem solving and superior cognitive abilities in this way (Özer, 2005, p. 122).

Since the discovery learning strategy requires learning by reasoning; students are caused to reach from part to whole after examples are presented by the teacher (Güven, 2015, p. 159; Pilli, 2016, s. 114; Şeyihoğlu, 2018, s. 85). Having provided sufficient examples with regards to the subject of the study within the frame of the proximodistal principle (Reasoning-Induction); students were guided to work up a relation between the examples and allowed to reach from part to whole. Amongst the interior layers of the ground; primarily the characteristics of lithosphere and then, of the core were emphasized. The mockup displaying the interior structure of the Earth was used as an example and students were ensured to comprehend the characteristics of the layers forming the interior structure of the Earth. Since the preliminary information of students regarding the study's subject is restricted to the 6<sup>th</sup> grade science lesson; the scientific infrastructure that students have was highlighted. Incomplete and wrong acquisitions were rectified by means of instant feedback and corrections and a lesson plan was prepared. Students were; therefore, allowed to acquire information by discovering.

Activities compatible with the actional, imagine and symbolic periods constituting the cognitive development process of Bruner (Kara ve Özgün-Koca, 2004, p. 3; Senemoğlu, 2015, p. 58-59) were designed over the course of the research. For instance, students' dividing the potato with the help of a knife used to make the mockup displaying the interior under the teacher's scrutiny refers to the actional period (Photograph 2a); students' drawing the interior layers of the Earth on the potato mould refers to the imagine period (Photograph 2 b, c, d); while students' painting each layer in different colors refers to the transition to the symbolic period (Photograph 2 c, d; 3 a, b, c, d). The subject covered was this way ensured to be acquired by experience and discovery.

In the discovery learning strategy; students are not individuals taking notes and listening to the lesson silently. This teaching strategy should not be perceived as students doing and discovering things independently without receiving any assistance. The teacher occasionally guides students and causes them to perform the lesson activities actively. Students are learners interacting (by talking etc.) with their peers and overcoming problems in cooperation with their peers regarding the lesson activities. The number of students participating in the lesson increases as well as their active participation in lessons through cooperation (Arslangilay, 2016, p. 180; Tunç ve Geçit, 2016, p. 874). Unless the teacher is able to manage this situation well; there may be discipline-related problems in the lesson. In our study, some discipline-related problems were experienced while preparing the mockup. Additionally, preparation of the mockup increased the teaching-learning process. In addition to that, the requirement for too many lesson tools (A globe-like, middle-sized potato, pencil, knife, scissors, napkin, board paint, toothpick, an A4 paper and adhesive was used in the study) increased the economic cost of the lesson. In the event that these problems can be overcome; the

discovery learning strategy can be used more commonly in geography lessons. According to the result of the mentioned study; the methods used the most in geography teaching include the demonstration teaching strategy, the lecturing, which is shaped according to this strategy; and question-answer method. Additionally, the strategies of discovery learning, latent teaching, cooperative teaching and research-examination teaching are applied to in geography teaching (Akbulut, 2004, p. 68; Artvinli et al., 2003, p. 23; Kocalar and Demirkaya, 2017, p. 337-338; Ünal, 2012, p. 348-355; Öztürk, 2004, p. 79; Ünlü, 2014, p. 81-136).

As a result of the studies conducted based on the discovery learning strategy regarding the science and mathematics teaching by forming experimental and control groups; it was revealed that individuals in the experimental groups were able to structure information in depth and associate it in a better way to their daily lives compared to those in the control groups. Activities conducted with concrete materials were determined to contribute to the motivation of students better and increase their academic success (Ünal and Ergin, 2006, p. 46; Özcan and Türnüklü, 2013, p. 38; Sülün, Çakır, Şenler and Çil, 2007, p. 59-60; Bilgin and Dinç, 2003, p. 138; Biber, 2006, p. 17). Analyzing the relevant literature, studies similar to aforementioned ones are observed not to have been conducted for geography teaching. Similar studies can be performed for geography lesson, too. For instance, the effect of implementation of the discovery learning strategy in geography lessons on students' learning level, creativity and academic success can be studied. Academic studies that have been performed indicate that the demonstration teaching strategy is commonly used by geography teachers in Turkey (Artvinli, Kılıçaslan and Bulut, 2003, p. 23; Kocalar and Demirkaya, 2017, p. 337-338; Ünal, 2012, p. 348-355). The demonstration teaching strategy saves time in terms of ensuring a meaningful learning and acquisition of plentiful information by students in short-term. More common use of the demonstration teaching strategy in geography teaching is thought-provoking. Within this frame, various reasons may be available as to why the discovery teaching strategy is used in geography lessons less. As explained before, the facts that the use of discovery teaching strategy increases the teaching time, requires too many lesson tools and increases economic costs and increasing discipline-related problems etc. may cause geography teachers to opt for applying to the demonstration teaching strategy instead of the discovery learning strategy. In addition to these; it can be stated that geography teachers do not have sufficient teaching abilities (Artvinli, Kılıçaslan and Bulut, 2003, p. 23) and high education geography teaching bachelor programs do not contribute teachers in terms of the development of teaching abilities (Artvinli, Kılıçaslan and Bulut, 2003, p. 23; Karakuş, 2007, p. 11).

In conclusion, it is seen that the discovery learning strategy, which is the focus of this study, ensures meaningful learning and is appropriate for geography teaching even though the lesson is time consuming and increases the economic costs since it allows students to acquire information by discovering and experiencing. It is our desire that our study will be useful for geography and other branch teachers and constitute a basis for prospective studies.

## **Recommendations**

The discovery teaching strategy directs students to act together with their knowledge. It is; therefore, appropriate and useful for geography teaching (Ünal, 2012, s. 358). Consequently, activities and plans can be made to encourage geography teachers and prospective geography teachers to make use of the discovery learning strategy in geography lessons. For instance, geographical modeling activities can be benefited from because students use processes such as interpretation and geographication while working on real life conditions throughout the geographic modeling process. The relation between the discovery learning strategy and geography teaching can be analyzed in depth.

In our study; a structured geography lesson, planned and programmed by means of discovery learning, where learners are directed with instructions and tips was covered. Learning process can be ensured to be permanent by use of the structured discovery learning in geography lessons. Our study was maintained in an active and collaborative way and ensured that learners acquire information by discovering it. Students can be caused to acquire information by discovering by means of an active and collaborative teaching process using the discovery learning strategy. Students can be allowed to participate in lessons actively and get motivated for it thanks to the discovery learning strategy. The implementation of the discovery learning strategy in geography lessons should include the proximodistal principle (Reasoning-Induction) while teaching. For instance, students should learn the outline of their neighborhoods before learning the map of the city they live in. Results of the research indicate that the preliminary information about the subject is restricted to the science lesson information of the 6<sup>th</sup> grade. For this reason, the preliminary information that students have must be paid attention. Sufficient number of examples were provided regarding the subject for which activities were carried out within the scope of our study and students were guided to establish relationships between the examples. When discovery learning strategy is applied to in geography teaching; the geography teacher should provide sufficient number of examples about the lesson subject and guide students to establish relations between these examples. Students should be encouraged to do individual and group work to allow them to reveal their genuine and creative ideas. The activity carried out within the scope of our study was maintained in a planned way and deficient and wrong acquisitions were corrected instantly. In the event that geography class is lectured by means of the discovery learning strategy; the geography teacher should plan the lesson and correct wrong and deficient acquisitions instantly.

It was observed over the course of the study that it takes students too long to examine and compare the examples provided in the geography lesson and to establish relations between the examples; and it causes the teaching-learning process to prolong, which should be taken into account while planning a lesson. Implementation of a lesson by means of the discovery learning requires more lessons materials, patience and time (Şeyihoğlu and Geçit, 2018, p. 86). As can be seen in our study; the discovery learning strategy reveals the requirement for plentiful tools and causes the economic cost of the lesson to increase, which also should be taken into account while planning a lesson. The discovery learning strategy is not appropriate for overcrowded classes since it makes it

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difficult to control the classrooms. A geography teacher should consider the number of students in his/her classroom while planning to use the discovery learning strategy. Studies for the discovery learning strategy to be implemented with more large scale groups and different variables should be performed. It will also be benefitting that academic studies comparing the discovery learning strategy and other teaching strategies in geography teaching will be conducted.

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