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Eliminating Misconceptions in Social Studies Course with Dual-Situated Learning Model: Action Research

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Abstract

The Dual-Situated Learning Model (DSLM) is an alternative learning model that can be used to minimize misunderstandings. DSLM emphasizes that the activities should start with both the qualifications of the concept and the ontological view of the students toward the concept. The research aims to reveal the cognitive state of the concepts before the lesson, and the cognitive development of the students after the lesson covering the concepts in the 5th grade "People, Places and Environments" learning area in the 2021-2022 academic year in the Social Studies curriculum and to examine the process of the conceptual change. Within the scope of the research, the action research design, one of the qualitative research methods, was adopted. The participants of the research consist of 31 students in the 5th grade of Havuz Secondary School (pseudonym) in the Sarız district of Kayseri province in the 2021-2022 academic year. Field notes, word association tests for assessment, and tools to teach concepts such as concept maps, conceptual change texts, semantic analysis tables, concept networks, and diagnostic branched trees were used for data collection. Researcher notes, unstructured observations, and worksheets were used to support and understand the process in general. The study's findings revealed that the activities within the frame of DSLM in the action research were successful in eradicating students' false beliefs about the concepts of climate, weather, continental climate, Mediterranean climate, and the climate of the Black Sea. At the end of the research, we offered various suggestions for practice and research based on the results.

Keywords

Dual-Situated Learning Model (DSLM)

Concept teaching

Misconceptions

Social studies

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Introduction

Nowadays, due to the rapid development of technology and science and the difficulty of transferring all information to learners, teaching concepts have been emphasized recently (Özmen, 2005). From the moment of birth until the moment of death, concepts hold sway over human life, because people must express thought, behavior, or emotion conceptually. An important milestone in concept teaching is primary education. In this period, it is important to teach the concepts to children in a planned and correct way (Özdemir, 2014).

In the process of learning, concepts that students know, parts they struggle to comprehend, and probable misconceptions have an important role in structuring concepts meaningfully. This being the case, the knowledge of the concept and students' ways of thinking before, during, and after teaching should be investigated and revealed (Kabapınar, 2003). Recently, many studies have been conducted (Ayana, 2018; Boz, 2019; Kürümlüoğlu, 2019; Özdoğan, 2019; Şarlayan, 2017), and different methods have been utilized to eliminate the misconceptions of students. A method to eliminate these misconceptions is the Dual-Situated Learning Model (DSLM), which was developed by She (2002, 2004a, 2004b).

DSLM is an alternative learning model that can be applied to minimize misunderstandings (Amry, Rahayu, & Yahmin, 2017). DSLM emphasizes that the activities should start with both the qualifications of the concept and the ontological view of the students toward the concept. These elements are essential functions for developing DSLM events. DSLM activities have two functions: to create dissatisfaction with students' existing knowledge and to form new cognitive structures to construct scientifically correct concepts (She, 2002).

The most important feature of DSLM; is to ensure that students are dissatisfied with their incomplete and inconsistent knowledge of concepts compared to scientifically correct ones. Their inaccurate knowledge and the more they think that it is inadequate, the more they will be willing to replace these concepts with scientific ones. Additionally, through the activities employed in this model, there are changes in the ontological and epistemological views of the students toward the concepts, and simultaneously, the interests and curiosity of the students increase (Şen, 2011).

Teaching with DSLM increases students' conceptual understanding and permanence and shows its effect for a long time by keeping it in their memories (İpek Akbulut, 2013). The application of different teaching techniques together in DSLM activities for concept teaching helps to ensure that students' conceptual changes are at the desired level.

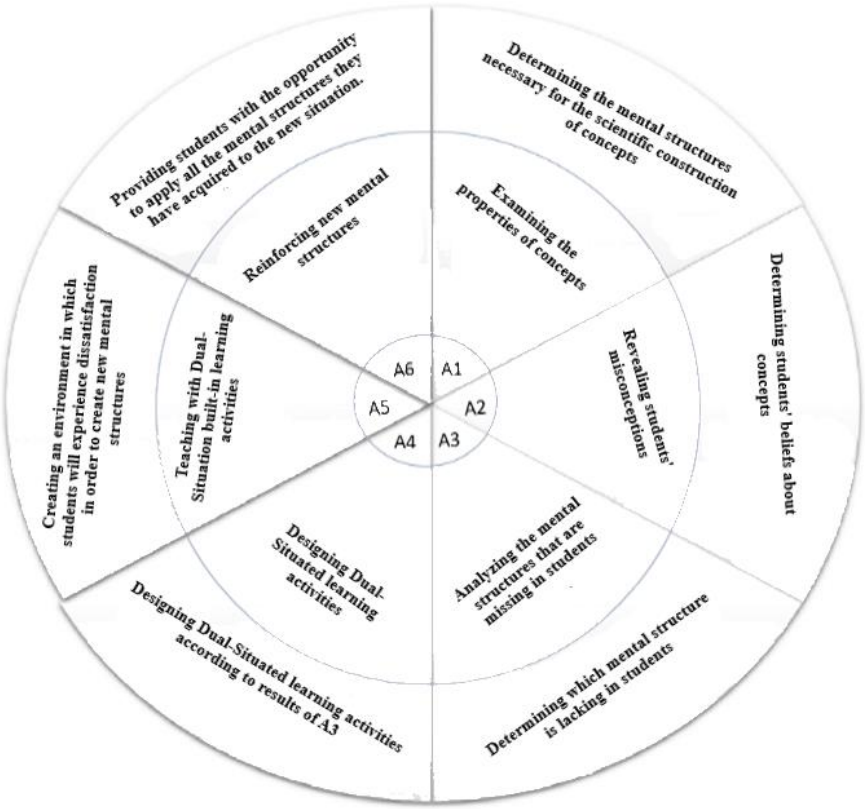


Figure 1. Dual-Situated Learning Model (She, 2004b)

DSLM consists of 6 stages (She, 2002, 2004a, 2004b). As is seen in Figure 1, first, the characteristics of the concept are investigated (A1), and the students' misconceptions are determined as a result of the research (A2). In the third stage, the missing concept structures of the students are determined (A3), and then DSLM activities related to the concept are prepared (A4). After the DSLM activities are prepared, to help students create new cognitive structures, providing dissatisfaction with their existing knowledge, activities are carried out in the lesson. (A5) Finally, reinforcement activities are carried out for the cognitive structures related to the concept (A6).

According to DSLM, conceptual changes should occur in the structures of concepts and students' beliefs about these concepts. Thus, these concepts are structured meaningfully by determining which cognitive structures are necessary. The structure in a model representing and explaining a certain event or knowledge in the mind is called the cognitive structure. More than one cognitive structure may be needed to make sense of and construct concepts (Şen, 2011).

Although DSLM, which is a conceptual change model, has been developed in studies on science teaching, it can also be used to provide students with conceptual changes in different courses (İpek Akbulut, Şahin, & Çepni, 2013). Therefore, this model can also be employed in the social studies course, which is very rich in terms of facts, concepts, and generalizations (Akbaş, 2020).

Most of the concepts in the social studies course, in which concepts specific to social sciences such as geography, history, psychology, sociology, archaeology, anthropology, and economy are taught, contain abstract features. In the teaching of these abstract concepts, teachers are expected to design and implement the concept teaching process by considering the individual differences of the students (Ünal & Er, 2017). Because in the teaching of abstract concepts in the social studies course, it has been determined that the concepts are not fully understood by the students, some of their features are confused, and the students have many misconceptions about the concepts incompatible with scientific facts (Bal & Akış, 2010; Bal & Gök, 2011; Demirkaya & Karacan, 2016; Sabancı, 2008). It is important for curriculum designers and practitioners to identify the perceptions of the concepts in the

Social Studies Curriculum and to understand the reasons for these perceptions. A proper understanding of how concepts are structured in students' minds, their misconceptions about concepts, and the reasons for these misconceptions will guide curricula, textbooks, and practitioners (Bal & Gök, 2011). On the other hand, to achieve the objectives of the social studies course, it is important that the teachers, who are the implementers of the course, have various knowledge, skills, and experience in concept teaching.

The social studies course, in which the subjects related to social sciences are taught according to the grades of the students, includes many concepts specific to social sciences (Çelikkaya, 2020; Ünal & Er, 2017). In all components of the Social Studies Curriculum, concept teaching is especially emphasized.

DSLM has primarily been used in the body of literature for science courses. (Akpınar & Ergin, 2007; İpek Akbulut et al., 2013, İpek Akbulut, Şahin & Çepni, 2015; She, 2002, 2004a, 2004b). Yet, there has not been any research on DSLM in the field of social studies teaching; for that reason, this study is significant.

Purpose of The Study

This research aims to remove misconceptions through conducting various activities on 5 concepts presented (Boz, 2019; Dere & Aktaşlı, 2022) in the 5th-grade Social Studies "People, Places and Environments" learning domain in the 2021-2022 academic year. For this purpose, the below-stated questions were asked.

1. How can the teaching of concepts against misconceptions be improved?
2. Which activities can be used within the framework of the action plan and how?

Method

In this section, there are explanations under the headings of research design, participants, environment, the role of the practitioner-researcher, data collection, and data analysis and interpretation.

Research Design

This study was put into practice by using the action research design, one of the qualitative research designs. According to Johnson (2014), action research is closer to qualitative research because action researchers "do not shape the environment to isolate variables".

The feature that distinguishes action research from other research is that it fills the gap between theory and practice and ensures that research results are directly reflected in practice. Whereas other designs focus on either situation/problem identification or just the solution, the action research design focuses on assessment and solution together as a whole. In other words, the results of the research can be transferred to the application immediately and new results can be reached by directly researching the results in the application. In this respect, action research is a research approach in which participation, reflection, and development processes are productively employed (Yıldırım & Şimşek, 2016).

"Action research can be carried out in four steps: determining the area to focus on, collecting data, analyzing and interpreting data, and developing an action plan" (Mills, 2003). In action research, it is important to realize social change by ensuring the development of individuals by collaborating (Aksoy, 2003). In this study, action research was preferred because the problem was identified in its natural environment, eliminated in its natural environment, and the researcher was a guide in the environment.

Participants

After determining the subject and purpose of the research, the location of the research is decided. Since the action research is backyard research (the researcher's workplace, etc.), Havuz Secondary School (pseudonym) was selected as the school where the research was conducted. Merriam (2013) stated the following regarding the selection of the participants:

> "In qualitative research, the researcher seeks to understand carefully and rigorously the specific or original in-depth, rather than finding out what the general truth about the majority is. For this, a single case or a small, non-random, purposeful sample is selected."

After the school was selected, the researcher started official procedures for obtaining research permission from the Ministry of National Education. After verbal consent was obtained from the school administration, the students were informed about the research, and positive feedback was received from the students. In the Havuz Secondary School, 41 students are studying in 5th grade. The study was conducted with 31 students due to parental consent and transportation issues. Eleven of these students are boys and twenty of them are girls. In line with research ethics, pseudonyms (for example, Damla, İrem, Mustafa, Kaan, etc.) were used instead of the real names of the students.

The school setting

The environment in which the research conducted is a factor affecting the results of the research. For this reason, it was decided to describe this research environment. Havuz Secondary School consists of a single 5-storey building. They allocated half of the school to the Havuz High School (pseudonym) where high school students study. There is a shelter, heating room, warehouse, and conference hall in the basement, seventh grades, informatics class, and cafeteria on the ground floor. On the 1st floor, there is the teachers' room, the principal's room, the assistant principal and the 8th and 6th classes, and the science laboratory. On the 2nd floor, there are the 5th and 6th grades of the secondary school.

The Role of the Practicing Researcher

There are different action research classifications in the literature, and based on these classifications in the literature, action research types are expressed under three headings (Lune & Berg, 2017). To summarize these types, technical-scientific-collaborative action research is used to test or evaluate an application within a predetermined theoretical framework. Action research focused on practice/cooperation/discussion is used to identify possible field problems that arise in practice, possible factors that cause these problems, and possible ways of intervention by coming together between the researcher and the practitioner. Liberating/developing/critical action research is adopted to acquire new knowledge, skills, and experiences and to develop a critical perspective toward their practices (Yıldırım & Şimşek, 2016). Yıldırım and Şimşek (2016) deemed it appropriate to add to this classification made by Lune and Berg (2017); while continuing the application, a different type was added in which the practitioner who collected the data on the determined problem was also the researcher.

In this research, which was designed as backyard research, the practitioner assumed the role of the researcher, who is close to abovementioned the fourth type. The researcher carried out the collection of data, planning, and implementation of the process with the guidance of the consultant. The researcher has been working for 2 years at the school where the research was conducted and has 7 years of professional experience. The researcher took courses on qualitative research during post-graduate education and completed his master's degree with his work on action research.

Action Research Process

The steps followed in this action research process consist of determining the research topic, literature review, preparation of the action plan, implementation process, data collection, analysis, and interpretation of the data, reaching the research results, and reporting. In the first stage, the subject of the research was determined, and then the relevant literature was scanned. After the literature review was performed, research questions were created and the classroom in which the application would be made was determined and necessary permissions were obtained.

Action plans and teaching materials were prepared by taking the opinions of field experts. It is expected that the application of the action research will be carried out in 3 weeks and 9 class hours. The researcher implemented action plans. The data collected during the implementation process were analyzed by the help of descriptive analysis. In the last stage, the results of the analysis were obtained and the research was put into report form. The activities carried out during the action research process can be explained as follows:

The researcher, who focused on concept teaching, decided on the subject of "The Effect of Climate on Our Lives" in the 5th grade "People, Places and Environments" learning domain, which is a subject that students have difficulty in, on the basis of his experiences and bilateral conversations with the group teachers. Textbooks and Social Studies Curriculum were examined for the concepts to be taught to the students regarding this subject, and we focused on 5 concepts.

In the 2018 Social Studies Curriculum, the Social Studies course is planned as three lessons per week. However, since this course hour was insufficient for implementation, we held additional courses with the permission of the school administration and other course teachers, especially in cases where the additional action plan, which is inherent in the action research, had to be implemented. The applications made after the planning are shown in Table 1.

Table 1. Action Research Process and Unit-Related Learning Outcomes

Week	Learning Outcome	Concepts	Activity
	SB.5.3.2. Students explain the effect of the climate seen in their living environment on human activities by giving examples from their daily life.	Climate Weather Forecast	Word Association Test Conceptual Change Text Concept Network
2	SB.5.3.2. Students explain the effect of the climate seen in their living environment on human activities by giving examples from their daily life.	Black Sea Climate Mediterranean Climate Continental Climate	Word Association Test Conceptual Change Text Concept Map
3	SB.5.3.2. Students explain the effect of the climate seen in their living environment on human activities by giving examples from their daily life.	Climate Weather Forecast Black Sea Climate Mediterranean Climate Continental Climate	Meaning Analysis Table Diagnostic Branched Tree Worksheet Word Association Test

Collection of Data

It has been stated that there are many types of data and a wide variety of methods for collecting data in qualitative research, and the important thing when determining data collection tools is to use or adapt the methods that best suit your research question and teaching situation (Johnson, 2014). The tools used to collect data in this study can be grouped under three headings:

Data Collection Tools Used for the Assessment of Students:

Word Association Test: It is used for purposes such as revealing students' cognitive structures, detecting misconceptions, and identifying conceptual changes (Bahar & Özatlı, 2003; Ercan, Taşdere, & Ercan, 2010). In this research, the Word Association Test was prepared to determine the existing knowledge and post-lesson status of students. This test was applied in the first lesson and at the end of the lesson. It was applied at the beginning and end of the lessons for the weekly concepts.

Data Collection Tools Used for Concept Teaching:

Concept Map Form: Concept maps are tools that show an event or issue collectively and briefly indicate concepts and relations between concepts and principles (Ministry of National Education [MoNE], 2006). Concept maps help to present the subject as a whole by visualizing.

Concept Network: A concept network is a graphic tool that displays students' impressions and thoughts in accordance with the concepts and principles in written teaching tools (textbook, encyclopedia, etc.) (Talim Terbiye Kurulu Başkanlığı [TTKB], 2005).

Conceptual Change Text Form: Conceptual change is the replacement of erroneous knowledge of students with correct information (Şeker, 2010). During the research process, it was observed that the students confuse some concepts with each other, and then conceptual change texts for related concepts were prepared. These conceptual change texts were applied in the first and second weeks. While preparing the conceptual change texts, a text of at least half a page was created on the basis of the dictionary definitions and concept analysis of the concepts used interchangeably by the students, and sometimes visuals support these texts.

Meaning Analysis Table: This tool is developed as a two-dimensional table with an activity that students also participate in. In one dimension of the table, entities or concepts whose properties are to be analyzed take place, while properties are listed in the other dimension. The Meaning Analysis Table can be used effectively to learn the descriptive and distinctive features of the concepts. While preparing this tool, the student connects the meanings of the words they learned to the words they already know; thus, they develop their knowledge of the concept (TTKB, 2005).

Diagnostic Branched Tree: This technique is an assessment tool applied to check what students have learned about a subject. It can be said that this technique is similar to traditional true-false tests, but in true-false tests, each question is handled separately, and mostly, a question is independent of the previous or the next question (Çelikkaya, 2014).

Data Collecting Tools to Support and Understand the Process Overall

Worksheets: These are the papers that the teacher distributes to the students at the end of each subject, which can be used for reinforcement purposes, homework, and evaluation purposes (Anderson, 1995). Worksheets are effective in attracting students' interest in the lesson, increasing their participation in the lesson, ensuring that they are responsible for their own learning, expressing their thoughts easily, structuring the information in their minds correctly, and fostering student achievement (Işık & Özdemir, 2014).

Researcher Notes-Observation: These are the notes reflecting the researcher's own observations (and sometimes reactions). Care should be taken to prevent these notes open to interpretation and to be descriptive as much as possible (Yıldırım & Şimşek, 2016). The researcher mostly recorded unstructured observations after the application in his notes.

Analysis and Interpretation of Data

By analyzing the data collected using the Word Association Test, frequency tables were created showing the frequency of repeated words for key concepts.

The obtained data were recorded in a frequency table consisting of key concepts and answer words. In light of the data in this frequency table, conceptual networks revealing the cognitive structure of the students were drawn. In addition, the related sentences they formed for each concept were analyzed by classifying (categorizing) according to the meanings they contain and the features they possess. The category names and what the categories cover are given below (Ercan et al., 2010):

- Sentence Containing Scientific Information: It contains answers that include all aspects of the scientific answers related to the question. They are completely correct statements.
- Non-Scientific or Superficial Sentence: It includes answers that contain one or more aspects of a valid scientific answer, but do not specify all aspects. Partially correct perceptions are also included in this category.
- Sentence Containing Misconceptions: Student answers, inconsistent scientific information, and include alternative explanations are given in this category.

- No Answer: This category includes the answers that the students left blank. Irrelevant or unclear answers are also included in this category.

Reliability

In the study, all processes and stages were tried to be explained in detail. In this context, it is clearly stated how the data collection tools were developed, how the applications were made, and how the data were analyzed and interpreted. In addition, the data obtained as a result of the analysis were tried to be described by supporting direct quotations. In the findings, the expressions in the worksheets, and student and researcher diaries were scanned and presented, and the communication sections obtained from the observations were included. In the context of consistency studies, different data collection tools were used in the research, worksheets were collected, and data loss was tried to be minimized. In order to ensure the credibility of the research, the codes of the two researchers (lecturer and teacher/doctoral student) and their situations were compared in order to confirm whether the sentences that emerged in the research represented the aforementioned conceptual categories. After the two field experts coded research data separately, the resulting code list took its final form. The consistency of the codes used by the researchers independently from each other was determined by marking them as "Agreement" or "Disagreement". The cases where the researchers used the same code for the students' expressions were accepted as agreement, and the cases where they used different codes were accepted as disagreements. The reliability of the data analysis performed in this way was calculated using the formula [Agreement / (Agreement + Disagreement) x100] suggested by Miles and Huberman (1994) and based on this, the consistency rate of the study was found to be 93%.

Permission Information of the Research

In this study, all the rules specified to be followed within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were complied with. None of the actions specified under the heading "Actions Contrary to Scientific Research and Publication Ethics", which is the second part of the directive, have been taken. First, the ethics committee permission was obtained from Kırşehir University, then an official permission was obtained from the provincial directorate of national education.

Ethics Committee Approval

Ethics committee approval of the study was obtained at the second session of the Ethics Committee of Kırşehir Ahi Evran University on March 03, 2022. The ethics evaluation document number is 2022/02/23.

Permission from the Provincial Directorate of National Education

Research permission was obtained from the Kayseri Provincial Directorate of National Education to carry out the research. The date of this permit is 04/04/2022, and the number is 47230382.

Parental Consent

In addition, permission was obtained from the parents for the use of the data obtained in the study. A permit has been created for this. In this document, information about the research and data collection tools is included. It was stated in the report of the research that they wanted to benefit from this data if they approve permission. It is committed that any personal information of the students will not be included in the reporting. It is stated that if they sign the permission document, it will be assumed that they approve the application. The permission certificate was delivered to the parents, and the teacher informed them. Permission documents signed by the parents of the students were collected.

Findings

In this part of the research, statistical analysis of the data obtained in line with the problems and sub-problems prepared for the research are included.

For the DSLM process firstly, field experts and group teachers were interviewed. Then, it was determined in which subjects the students had difficulties. Among the determined subjects, the subject of "The Impact of Climate on Our Lives" was chosen in the learning domain of "People, Places and Environments" in the 5th Grade Social Studies course. As a result of examinations, it was decided to teach the concepts of "Climate, Weather, Terrestrial Climate, Mediterranean Climate, and Black Sea Climate" with regard to the opinions of field experts and group teachers.

During the examination of the concept features, which is the first step (A1) of the DSLM process, the cognitive structures required for the scientifically construction of the concepts were determined. In the determination of cognitive structures, cognitive structures were revealed by examining the content of the subject given in the learning domain of 'People, places, and environments' in the Social Studies 5th Grade Coursebook (Harut, 2021) taught in the 2021-2022 academic year and within the framework of the S.B. 5.3.2 learning outcome in the 2018 Social Studies curriculum. These structures are:

Cognitive Structure 1: Climate is the average of weather events that have been effective over a wide area for many years.

Cognitive Structure 2: Climate and weather are different concepts.

Cognitive Structure 3: While the weather changes in a short time, the change of the climate does not.

Cognitive Structure 4: Different types of climates are seen in different places.

Cognitive Structure 5: Every climate has certain characteristics and plant species.

Cognitive Structure 6: There are 3 climate types in Turkey.

After the scientific structures were determined, the Word Association Test was prepared to reveal the misconceptions of the students, which is the second step (A2) of the DSLM process. At the beginning of the first lesson, Word Association Test was applied as a pre-test to reveal students' perceptions about the concepts of "climate and weather" (Figure 1).

The word association test was collected and the cognitive structures of students that were missing were analyzed as the third level (A3) of DSLM. As a result of the analysis, the fourth stage of the DSLM process was performed to eliminate the misconceptions of the students. In the fourth stage (A4), action activities were prepared for the identified misconceptions.

A lesson plan was prepared for teaching the lesson by using the activities in the fifth stage (A5) of the DSLM process. In the second and third lesson hours, when the answers given by the students regarding the concepts of "climate and weather" were said anonymously in the first lesson assessment, the student named Ömer started to laugh by saying *'I made the sentence you said (we used to call the climate the season)'*. When a different word (global warming) was read, it was observed that the students who gave the same answer in the class, Kadir, Ayça, and Berat, laughed, saying that they had used the same word and some of them were embarrassed. Examples of tests related to the answers given by these students are given in image 1.

KAVRAM	İLİŞKİ	CÜMLE
Devlet	Yönetim	Devletimizin yönetim şekli cumhuriyettir.
Devlet	İktidar	Devleti iktidar partisi yönetir
Devlet	Para	Devlet parayı kullanır
Devlet	Seçim	Devleti yönetenler seçimle işbaşına gelir.
Devlet	Vatan	Devletin üzerinde yaşadığı toprak parçası vatandır

KAVRAM	İLİŞKİ	CÜMLE
İklim	Mevsim	Biz iklime mevsim diyoruz. Y
İklim	Kış	Bugün hava çok karlıydı. Y
İklim	Yaz	Ben ailemle yazın tatile gittim Y
İklim	Sonbahar	Sonbaharda yapraklar dökülür Y
İklim	İlkbahar	Amcamlar ilkbaharda gelirler. Y

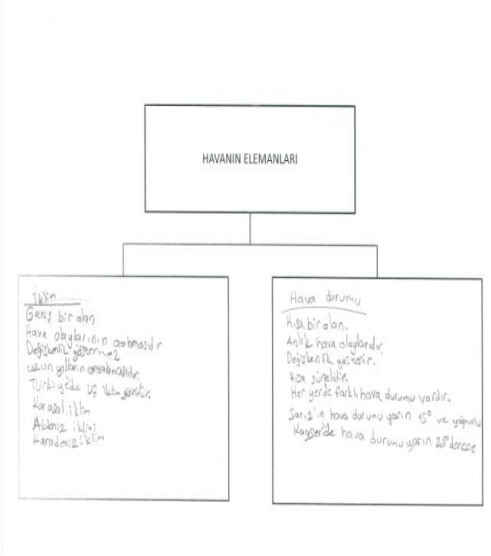
Sample of Word Association Test completed by the student

KAVRAM	İLİŞKİ	CÜMLE
Hava Durumu		
Hava Durumu		
Hava Durumu		
Hava Durumu		
Hava Durumu		

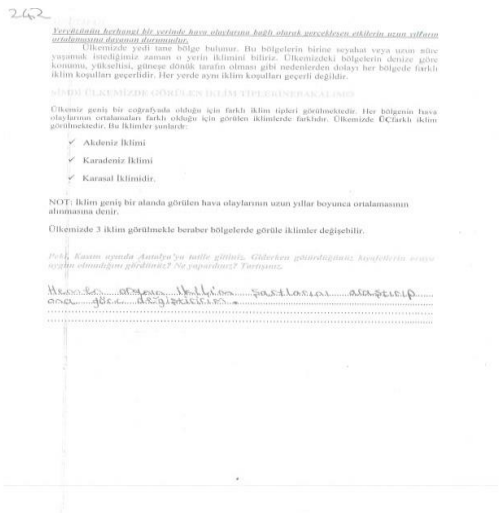
Sample of Word Association Test completed by the student

Image 1. Example of Word Association Test for the Sentences Written by Students That Create Discontent

After this stage, the lesson was taught using the concept network form and the conceptual change text for these concepts to eliminate the identified deficiencies (Image 2).



Concept Map Form (Student Examples)



Conceptual Change Text (Student Examples)

Image 2. Examples of Student Answers

In the sixth phase (A6) of the DSLM process, "What? On Which Side?" Designing an activity consisting of various questions titled, it was tried to reinforce the cognitive structures of the students. Then, the Word Association Test was applied again to evaluate the effectiveness of meaningful learning (Image 3).

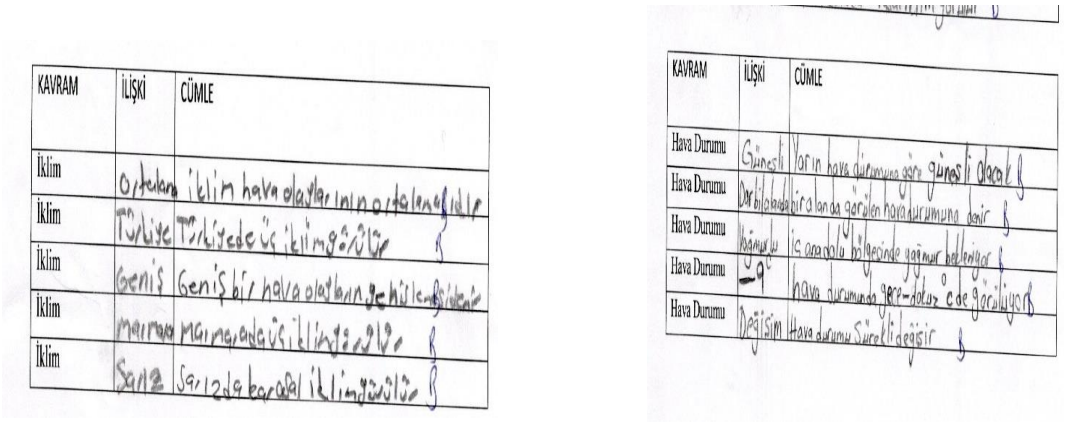


Image 3. Examples of Student Answers to the Word Association Test

In the A2 stage, the Word Association Test, which was used to determine the mental structures of the students, was examined, and when the class passed to the A5 stage, the sentence "Global warming, the climate, does not leave us alone", which was written by a student in the classroom with the words "Global warming, rain", without saying his name, the student started laughing looking at his friends. In addition, his friends continued to laugh by saying, "He wrote the same word as me". When another student's sentence "Climate consists of environmental problems", which he wrote with the words "weather, environment, global warming", was read, that student also started to laugh, and his friends joined him and continued to laugh. After teaching the concepts with the DSLM activities in the A5 and A6 stages, "Global warming, environment, rain, season, etc." when I say the words, this time the students say, "Teacher, the climate is not that, the climate is seen in a wide area", "It is called the long-term average of weather events." They started to give scientific answers in the form of scientific answers and wrote these scientifically produced words and sentences in the Word Association Test.

The analysis results of the Word Association Tests based on climate and weather conditions are given in the tables below.

Table 2. Findings Concerning the Number of Words (Relationships) and Sentences Written About Concepts Regarding the Effect of Climate on Our Lives

Key Terms	Word count (*f*)		Sentence-count (*f*	
	Pre-test	Post-test	Pre-test	Post-test
1. Climate	**139**	151	**139**	151
2. Weather Condition	**116**	149	**116**	149

When Table 2 is examined, it is seen that while each student wrote words (relationships) and sentences for all concepts in the post-test, the number of words and sentences belonging to both concepts in the pre-test was lower than in the post-test. Within the scope of DSLM, the teaching of the lesson with conceptual change texts, then the concept map and other activities organized for children, changed the answers given by them. In the post-test, the number of sentences and words shows that meaningful learning occurs, and connections related to these words are formed in the cognitive structure of the students after the lesson.

Table 3. Pre-Test-Post-Test Frequency Table of Related Sentences Constructed by Students Regarding Key Concept

Key Concepts	SCSI*		NSSS**		SCM***		Null	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
1. Climate	-	143	8	6	131	2	16	2
2. Weather Condition	15	144	75	5	23	-	42	6
Total	98	341	86	11	140	8	36	-

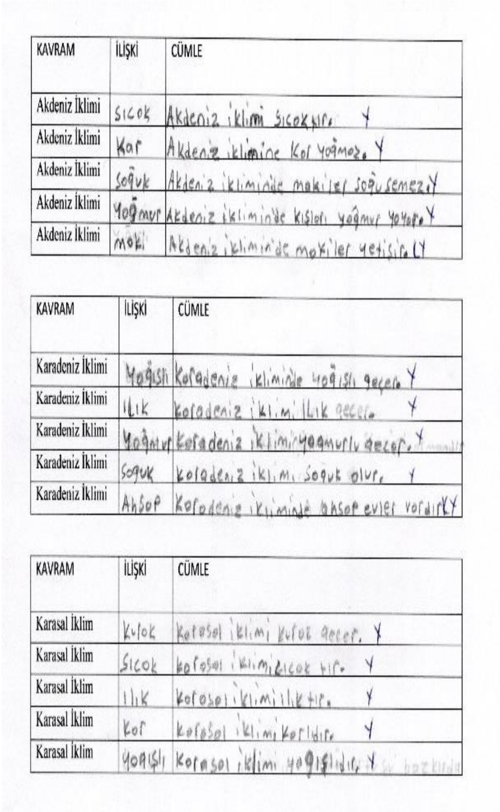
* sentences containing scientific information; ** non-scientific and superficial sentences; *** sentences containing misconceptions

When the data of the pre-tests and post-tests in Table 3 are examined, positive changes are observed. Significant increases are observed in the number of *sentences containing scientific information* (SCSI) about all key concepts. For example, "The average of weather events lasting for many years in a large area is called climate.", "In the case of weather, temperature, and coldness are measured in degrees." The number of *non-scientific and superficial sentences* (NSSS) showed a decrease in the key concept. For example, "Mediterranean Climate is seen in our country". Again, while the number of misconceptions is seriously reduced, it is seen that all the misconceptions related to the concept have been eliminated. In general, the numerical data in the table show that the students have experienced a conceptual change process in the scientific understanding and on the way to eliminate misconceptions.

In order to determine the cognitive structures of the students for the other three concepts within the scope of the research, "Mediterranean Climate, Black Sea Climate, and Continental Climate", the Word Association Test was prepared to reveal the misconceptions of the students, which is the second step of the DSLM process (A2). At the beginning of the first lesson, the Word Association Test was applied as a pre-test to assess students' knowledge about the concepts of "Mediterranean Climate, Black Sea Climate, and Continental Climate".

The Word Association Test was collected, and the missing cognitive structures of the students in the third level (A3) of DSLM were analyzed. As a result of the analysis, the fourth stage of the DSLM process was started in order to eliminate the misconceptions of the students. In the fourth stage (A4), action activities were prepared for the deficiencies identified.

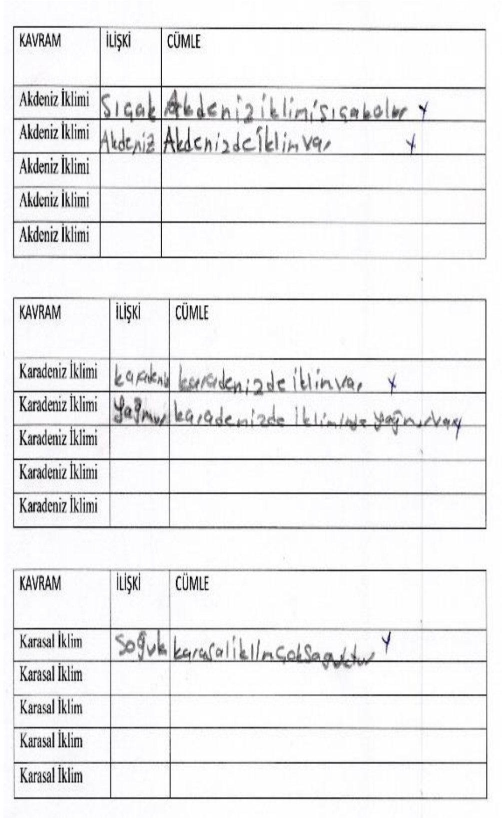
A plan was prepared for teaching the lesson by using the activities in the fifth stage (A5) of the DSLM process. In the second and third lesson hours, when the answers given by the students to the concepts of "Mediterranean Climate, Black Sea Climate and Terrestrial Climate" were said anonymously in the pre-test, a student named Murat said, "Teacher, I heard these words, but I did not write them." He frowned. Then, his other friends supported their friends by forming sentences such as "These are tough words, I can't think of much". Word Association Test examples related to the answers given by these students (It is fall in the Mediterranean climate, and there is the sun in the continental climate) and examples of the tests they did not answer are given in Image 4.



KAVRAM	İLİŞKİ	CÜMLE
Akdeniz İklimi	sıcak	Akdeniz iklimi sıcaktır. Y
Akdeniz İklimi	kar	Akdeniz iklimine kar yağmaz. Y
Akdeniz İklimi	soğuk	Akdeniz ikliminde makiler soğu sevmez. Y
Akdeniz İklimi	yağmur	Akdeniz ikliminde kışları yağmur yağar. Y
Akdeniz İklimi	maki	Akdeniz ikliminde makiler yetişir. Y

KAVRAM	İLİŞKİ	CÜMLE
Karadeniz İklimi	yağışlı	Karadeniz ikliminde yağışlı geçer. Y
Karadeniz İklimi	ılık	Karadeniz iklimi ılık geçer. Y
Karadeniz İklimi	yağmur	Karadeniz iklimi yağmurlu geçer. Y
Karadeniz İklimi	soğuk	Karadeniz iklimi soğuk olur. Y
Karadeniz İklimi	ahşap	Karadeniz ikliminde ahşap evler vardır. Y

KAVRAM	İLİŞKİ	CÜMLE
Karasal İklim	kurak	Karasal iklimi kurak geçer. Y
Karasal İklim	sıcak	Karasal iklimi sıcaktır. Y
Karasal İklim	ılık	Karasal iklimi ılıktır. Y
Karasal İklim	kar	Karasal iklimi karlıdır. Y
Karasal İklim	yağışlı	Karasal iklimi yağışlıdır. Y



KAVRAM	İLİŞKİ	CÜMLE
Akdeniz İklimi	Sıcak	Akdeniz iklimi sıcaktır Y
Akdeniz İklimi	Akdeniz	Akdenizde iklim var Y
Akdeniz İklimi		
Akdeniz İklimi		
Akdeniz İklimi		

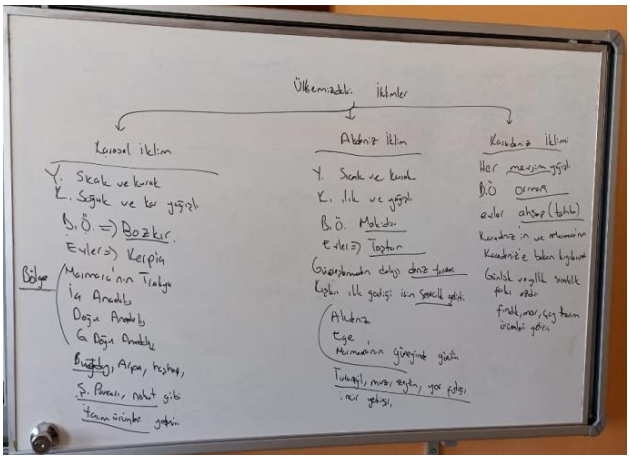
KAVRAM	İLİŞKİ	CÜMLE
Karadeniz İklimi	karadeniz	karadenizde iklim var Y
Karadeniz İklimi	yağmur	karadenizde ikliminde yağmur var
Karadeniz İklimi		
Karadeniz İklimi		
Karadeniz İklimi		

KAVRAM	İLİŞKİ	CÜMLE
Karasal İklim	soğuk	karasal iklim çok soğuktur Y
Karasal İklim		
Karasal İklim		
Karasal İklim		
Karasal İklim		

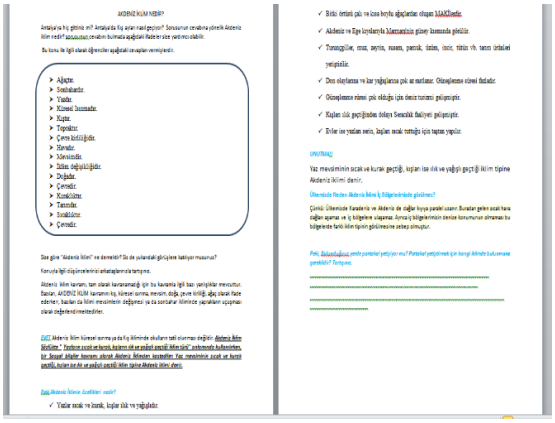
Applied Test sample Applied Test sample

Image 4. Example of Test for Sentences Written by Students That Create Discontent

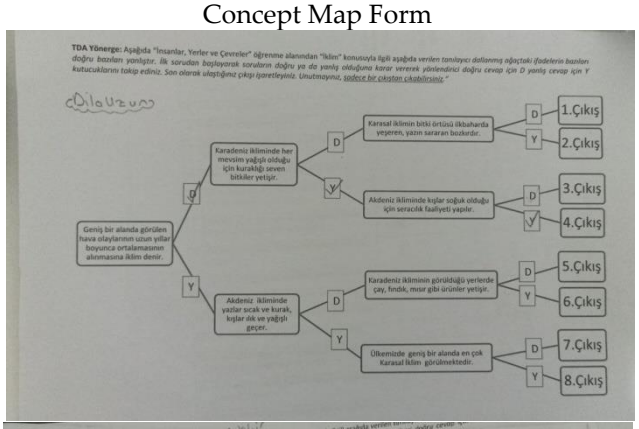
In order to eliminate the deficiencies identified after this (A4) stage, the lesson was taught using the Concept Map Form and the Conceptual Change Text in the (A5) stage for these concepts, and then the lesson was completed with the Diagnostic Branched Tree and the Meaning Analysis Table (Image 5).

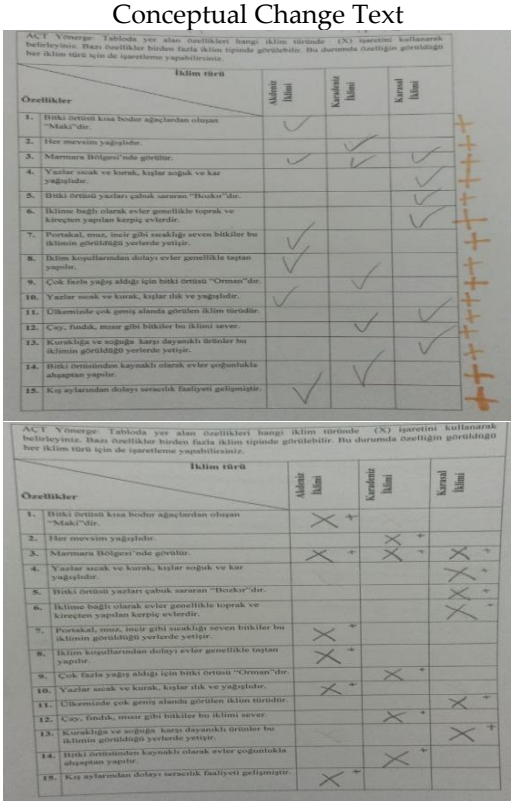


Concept Map Form



Conceptual Change Text



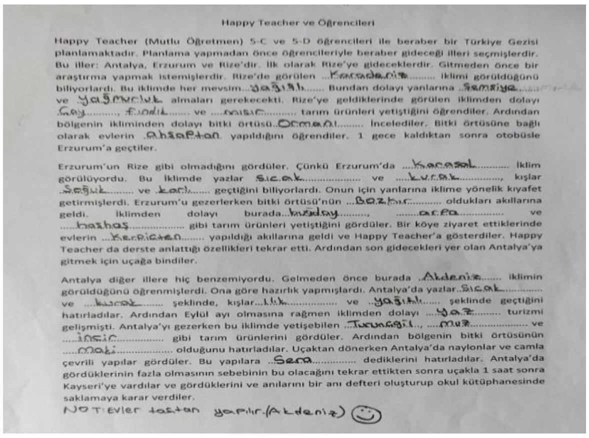


Diagnostic Branched Tree

Meaning Analysis Table

Image 5. Examples of Student Answers in Activity Practices

When the test to determine the cognitive structures of the students at the A2 stage was examined and when the activity passed to the A5 stage, the student named Tuğra, without saying his name, defined the Mediterranean climate as "Hot, dry, rainy" and started laughing looking at his friends when I read the sentence "Mediterranean climate is rainy" in the classroom. A student named İrem continued to laugh, saying, "My teacher, Tugra made a mistake, just like me." Anonymously, the student named Dila smiled and said, "Teacher, I couldn't write anything," and her friends said, "We couldn't write much, teacher." they continued to laugh. After completing the A5 stage, an activity called "Happy Teacher and Students" was prepared in the A6 stage in order to reinforce the cognitive structures of the students in Image 6.



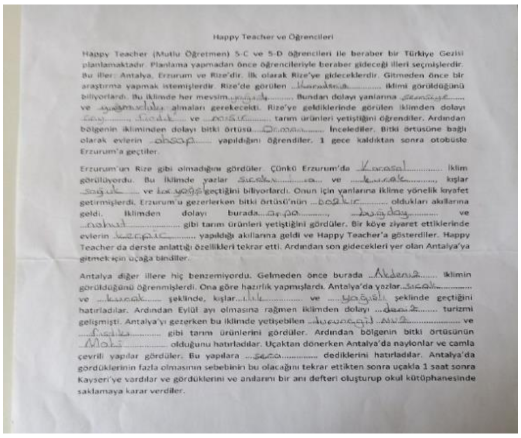
Happy Teacher ve Öğrencileri

Happy Teacher (Mutlu Öğretmen) 5-C ve 5-D öğrencileri ile beraber bir Türkiye Gezisi planlamaktadır. Planlama yapmadan önce öğrencileriyle beraber gideceği illeri seçmişlerdir. Bu iller: Antalya, Erzurum ve Rize'dir. İlk olarak Rize'ye gideceklerdir. Gitmeden önce bir araştırma yapmak istemişlerdir. Rize'de görülen ...Karadeniz... iklimi görüldüğünü biliyorlardı. Bu iklimde her mevsim...yağışlı... Bundan dolayı yanlarına ...şemsiye... ve yağmurluk almaları gerekecekti. Rize'ye geldiklerinde görülen iklimden dolayı çay..., fındık... ve ...mısır... tarım ürünleri yetiştiğini öğrendiler. Ardından bölgenin ikliminden dolayı bitki örtüsü..orman... İncelediler. Bitki örtüsüne bağlı olarak evlerin .ahşaptan. yapıldığını öğrendiler. 1 gece kaldıktan sonra otobüsle Erzurum'a geçtiler.

Erzurum'un Rize gibi olmadığını gördüler. Çünkü Erzurum'da ...Karasal... iklim görülüyordu. Bu iklimde yazlar sıcak... ve ...kurak..., kışlar ..soğuk... ve .karlı... geçtiğini biliyorlardı. Onun için yanlarına iklime yönelik kıyafet getirmişlerdi. Erzurum'u gezerlerken bitki örtüsü'nün ...bozkır... oldukları akıllarına geldi. İklimden dolayı burada...buğday..., ...arpa... ve ...haşhaş... gibi tarım ürünleri yetiştiğini gördüler. Bir köye ziyaret ettiklerinde evlerin ...kerpiçten... yapıldığı akıllarına geldi ve Happy Teacher'a gösterdiler. Happy Teacher da derste anlattığı özellikleri tekrar etti. Ardından son gidecekleri yer olan Antalya'ya gitmek için uçağa bindiler.

Antalya diğer illere hiç benzemiyordu. Gelmeden önce burada ..Akdeniz... iklimin görüldüğünü öğrenmişlerdi. Ona göre hazırlık yapmışlardı. Antalya'da yazlar..sıcak... ve ...kurak... şeklinde, kışlar...ılık... ve ..yağışlı... şeklinde geçtiğini hatırladılar. Ardından Eylül ayı olmasına rağmen iklimden dolayı ...yaz... turizmi gelişmişti. Antalya'yı gezerken bu iklimde yetişebilen ..Turunçgil.., ...muz... ve ...incir... gibi tarım ürünlerini gördüler. Ardından bölgenin bitki örtüsünün ...maki... olduğunu hatırladılar. Uçaktan dönerken Antalya'da naylonlar ve camla çevrili yapılar gördüler. Bu yapılara ..Sera... dediklerini hatırladılar. Antalya'da gördüklerinin fazla olmasının sebebinin bu olacağını tekrar ettikten sonra uçakla 1 saat sonra Kayseri'ye vardılar ve gördüklerini ve anılarını bir anı defteri oluşturup okul kütüphanesinde saklamaya karar verdiler.

NOT: Evler taştan yapılır.(Akdeniz) ☺



Happy Teacher ve Öğrencileri

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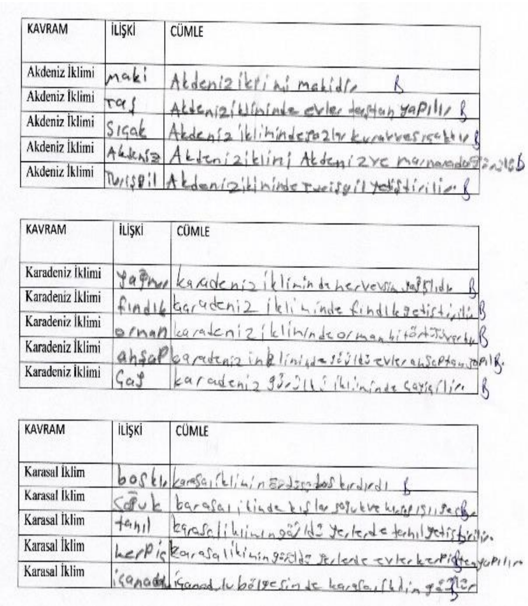
Erzurum'un Rize gibi olmadığını gördüler. Çünkü Erzurum'da ...Karasal... iklim görülüyordu. Bu iklimde yazlar ...sıcak... ve ...kurak..., kışlar ...soğuk... ve ...kar yağışlı... geçtiğini biliyorlardı. Onun için yanlarına iklime yönelik kıyafet getirmişlerdi. Erzurum'u gezerlerken bitki örtüsü'nün ...bozkır... oldukları akıllarına geldi. İklimden dolayı burada ...arpa..., ...buğday... ve ...nohut... gibi tarım ürünleri yetiştiğini gördüler. Bir köye ziyaret ettiklerinde evlerin ...kerpiç... yapıldığı akıllarına geldi ve Happy Teacher'a gösterdiler. Happy Teacher da derste anlattığı özellikleri tekrar etti. Ardından son gidecekleri yer olan Antalya'ya gitmek için uçağa bindiler.

Antalya diğer illere hiç benzemiyordu. Gelmeden önce burada ...Akdeniz... iklimin görüldüğünü öğrenmişlerdi. Ona göre hazırlık yapmışlardı. Antalya'da yazlar ...sıcak... ve ...kurak... şeklinde, kışlar ...ılık... ve ...yağışlı... şeklinde geçtiğini hatırladılar. Ardından Eylül ayı olmasına rağmen iklimden dolayı ...deniz... turizmi gelişmişti. Antalya'yı gezerken bu iklimde yetişebilen ...portakal..., ...muz... ve ...fıstık... gibi tarım ürünlerini gördüler. Ardından bölgenin bitki örtüsünün ...maki... olduğunu hatırladılar. Uçaktan dönerken Antalya'da naylonlar ve camla çevrili yapılar gördüler. Bu yapılara ...sera... dediklerini hatırladılar. Antalya'da gördüklerinin fazla olmasının sebebinin bu olacağını tekrar ettikten sonra uçakla 1 saat sonra Kayseri'ye vardılar ve gördüklerini ve anılarını bir anı defteri oluşturup okul kütüphanesinde saklamaya karar verdiler.

Happy Teacher and Students Activity Application Form (Student Samples)
Image 6. Examples of Student Answers in Activity Practices

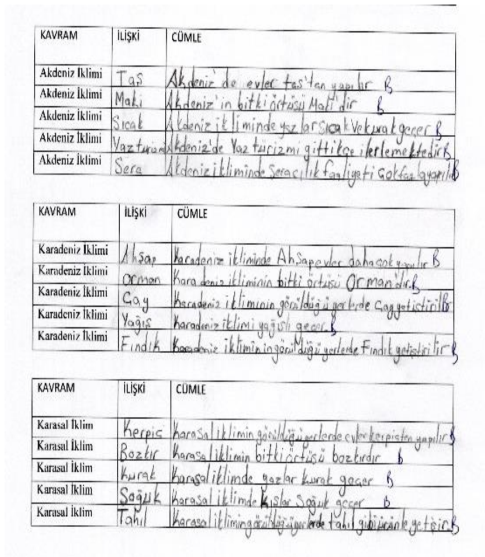
After teaching the concepts with DSLM activities in the A5 and A6 stages, when the words such as "hot, dry, precipitation, ice, spring" about the Mediterranean climate were said in the classroom, the students' scientific answers were as follows: "My teacher, the Mediterranean climate is not that, the summers in the Mediterranean climate are hot and dry", "The vegetation of the Mediterranean climate is maquis." Regarding the Continental Climate, which they knew very little about, it was seen that they made more sentences this time. For example, while a student named Nehir could not write any words or sentences at first, she wrote scientific sentences after the DSLM process: "The vegetation of the terrestrial climate is steppe", "The terrestrial climate is seen in regions far from the sea." Similarly, a student named İsa could not write any words or sentences about the Black Sea climate at first, but after the DSLM activities, "Black Sea climate is rainy in all seasons", "Black Sea climate is seen in places that have a coast to the Black Sea." He wrote down the words and sentences he produced scientifically on the test (Image 7).



KAVRAM	İLİŞKİ	CÜMLE
Akdeniz İklimi	maki	Akdeniz iklimi makidir B
Akdeniz İklimi	taş	Akdeniz ikliminde evler taştan yapılır B
Akdeniz İklimi	sıcak	Akdeniz iklimindeyazlar kurak ve sıcaktır B
Akdeniz İklimi	Akdeniz	Akdeniz iklimi Akdeniz'e ... B
Akdeniz İklimi	turunçgil	Akdeniz ikliminde turunçgil yetiştirilir B

KAVRAM	İLİŞKİ	CÜMLE
Karadeniz İklimi	yağmur	karadeniz ikliminde her mevsim yağışlıdır B
Karadeniz İklimi	fındık	karadeniz iklimnde fındık yetiştirilir B
Karadeniz İklimi	orman	karadeniz ikliminde orman bitki örtüsüdür B
Karadeniz İklimi	ahşap	karadeniz iklimide görüldü evler ahşaptan yapılır B
Karadeniz İklimi	çay	karadeniz görüldü ikliminde çay yetişir B

KAVRAM	İLİŞKİ	CÜMLE
Karasal İklim	bozkır	karasal iklimin bitki örtüsü bozkırdır B
Karasal İklim	soğuk	karasal iklimde kışlar soğuk ve kar yağışlı geçer B
Karasal İklim	tahıl	karasal iklimin görüldü yerlerde tahıl yetiştirilir
Karasal İklim	kerpiç	karasal iklimin görüldü yerlerde evler kerpiçten yapılır
Karasal İklim	iç anadolu	iç anadolu bölgesinde karasal iklim görülür B



KAVRAM	İLİŞKİ	CÜMLE
Akdeniz İklimi	Taş	Akdeniz'de evler taş'tan yapılır B
Akdeniz İklimi	Maki	Akdeniz'in bitki örtüsü Maki'dir B
Akdeniz İklimi	Sıcak	Akdeniz ikliminde yazlar sıcak ve kurak geçer B
Akdeniz İklimi	Yaz turizmi	Akdeniz'de Yaz turizmi gittikçe ilerlemektedir B
Akdeniz İklimi	Sera	Akdeniz ikliminde Seracılık faaliyeti çok fazla yapılır B

KAVRAM	İLİŞKİ	CÜMLE
Karadeniz İklimi	Ahşap	Karadeniz ikliminde Ahşap evler daha çok yapılır B
Karadeniz İklimi	Orman	Karadeniz ikliminin bitki örtüsü Orman'dır B
Karadeniz İklimi	Çay	Karadeniz ikliminin görüldüğü yerlerde Çay yetiştirilir B
Karadeniz İklimi	Yağış	Karadeniz iklimi yağışlı geçer B
Karadeniz İklimi	Fındık	Karadeniz ikliminin görüldüğü yerlerde Fındık yetiştirilir B

KAVRAM	İLİŞKİ	CÜMLE
Karasal İklim	Kerpiç	Karasal iklimin görüldüğü yerlerde evler kerpiçten yapılır B
Karasal İklim	Bozkır	Karasal iklimin bitki örtüsü bozkırdır B
Karasal İklim	Kurak	Karasal iklimde yazlar kurak geçer B
Karasal İklim	Soğuk	Karasal iklimde kışlar Soğuk geçer B
Karasal İklim	Tahıl	Karasal iklimin görüldüğü yerlerde tahıl gibi ürünler yetişir B

Image 7. Examples of Student Answers in Word Association Test Applications

The results of the analysis of the tests carried out regarding the Mediterranean, Black Sea and Continental Climate are given in Tables 4 and 5.

Table 4. Findings Regarding the Number of Words (Relations) and Sentences About the Concepts of Climate Types

Key Concepts	Word count (*f*)		Sentence count (*f*)	
	Pre-test	Post-test	Pre-test	Post-test
1. Mediterannean Climate	**64**	155	**64**	155
2. Black Sea Climate	**53**	154	**53**	154
3. Continental Climate	**18**	153	**18**	153

When Table 4 is examined, it is seen that while each student wrote words (Relationships) and sentences for all concepts in the post-test, the number of words and sentences belonging to all three concepts in the pre-test was lower than in the post-test. After the lesson was taught with conceptual change texts, Diagnostic Branched Tree, Meaning Analysis Table, and Happy teacher activities facilitated meaningful learning in children. In the post-test it shows that meaningful learning occurs during the teaching of the number of sentences and words and that connections related to these words are formed in the cognitive structure of the students after the lecture.

Table 5. Pre-Test Post-Test Frequency Table of Related Sentences Formed by Students Regarding Key Concept

Key Concepts	SCSI		NSSS		SCM		Null	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
1. Mediterranean Climate	10	151	9	2	45	2	101	-
2. Black Sea Climate	4	152	5	2	44	-	102	1
3. Continental Climate	1	152	-	1	17	-	137	2
Total	15	455	14	5	105	2	340	3

When the data of the pre-test and post-tests are examined in Table 5, positive changes are observed in terms of numbers and meaning in total and based on the concept. Significant increases are observed in the number of sentences (SSCI) containing scientific information about all key concepts. For example, "Since the summers are generally hot in the Mediterranean climate, sea tourism has developed.", "The continental climate is seen in the Central Anatolian Region.", "The vegetation of the continental climate is steppe." The number of sentences containing misconceptions (SCM) showed a decrease in the key concept. For example, a student named Sultan, who said, "Everywhere in the Black Sea Climate is the sea", wrote sentences containing scientific information such as "The vegetation of the Black Sea Climate is forest" after the DSLM activities. Again, while the number of misconceptions is seriously reduced, it is seen that all the misconceptions related to the concept have been eliminated. In general, the numerical data in the table show that the students have experienced a conceptual change process that is scientifically correct and eliminates misconceptions.

Discussions, Conclusion, and Suggestions

The conceptual change is defined as students abandoning their alternative concepts completely and internalizing scientific concepts. For conceptual change to take place, it is stated that first, students are uncomfortable with the existing alternative concepts, and the newly presented scientific information must be understandable, logical, and applicable (Posner & Strike, 1992, as cited in Talib, Matthews, & Secombe, 2005).

When the literature is reviewed, there is no DSLM studies on climate and other concepts, and when we look at the studies conducted with different methods (Elvan, 2012; Nurses, 2014) on these concepts, it is observed that the activities carried out in these studies facilitate concept teaching and they are effective in eliminating conceptual misconceptions.

With the help of DSLM, the deficiencies and confusions in the cognitive structures of the students were eliminated, and the process was completed successfully. Based on the pre-test and post-test findings, it can be said that teaching, according to DSLM, is effective in improving students' understanding and conceptual understanding of cognitive learning domains. This result shows parallelism with the results obtained from previous studies in different fields, that DSLM activities are effective in eliminating students' misconceptions, increasing their success, and providing conceptual change (Akpınar & Ergin, 2007; Lee & She, 2009; Liao & She, 2009; She, 2002, 2004a, 2004b; She & Lee, 2008; Tseng, Tuan, & Chin, 2009).

While the sentences formed in the pre-test for the five concepts of "The Effect of Climate on Our Lives" lacked scientific knowledge and content, in the post-test, it was observed that the number of sentences based on scientific knowledge and definition increased and the misconceptions were eliminated in the students' sentences.

In the pre-test, it is observed that too many words and sentences were written for the concept of "climate". However, when the written words and sentences are examined scientifically, it is seen that the words and sentences are not related to the climate. As a result of the Word Association Test analysis applied after the DSLM process, besides a quantitative increase in the number of words and sentences, it is seen that both words are related, and scientific sentences are written more as a result of scientific examination. This shows that meaningful learning occurs as a result of the activities within the DSLM carried out to eliminate misconceptions.

Since students are familiar with the concept of "weather" in their daily life, it is seen that the number of words and sentences this word is written too much in the pre-test. However, when examined scientifically, very few words and sentences were associated with the concept. As a result of the analysis made after the DSLM process, it was revealed that the number of words and sentences increased, and simultaneously, they wrote scientific words and sentences related to the concept.

The concept of "Mediterranean Climate" was one of the concepts that students had difficulty with. In the test, it is seen that the number of words and sentences related to the concept of the students written in the pre-test is less than the first two concepts. In the post-test, it was revealed that the number of words and sentences increased compared to the pre-test, and at the same time, scientific words and sentences related to the concept were observed.

When the Word Association Test pre-test results on the concept of "Black Sea Climate" were examined, many words and sentences were written that are not related to the concept in terms of both quantity and quality. Most of the students did not write words and sentences related to the concept and left them blank. When the post-test Word Association Test results after the DSLM process were examined, it was revealed that the situation was reversed. It is seen that more words and sentences have been written about the related concept. The related words and sentences are scientifically related to the concept, and as a result, the activities carried out show that they are effective in the realization of meaningful learning.

The last concept given to the students is "Continental Climate". According to other concepts, it is seen that the students wrote the least count of words and the least count of sentences in this concept. As a result of the examinations, it was understood that the words written were not related to the concept. After the activities were carried out during the process, an increase occurred in the number of both words and sentences in the post-test. When examined in terms of content, it is seen that the words and sentences written by the students are related to the concept, and scientifically correct words and sentences are written. This shows that meaningful learning occurs as a result of DSLM activities carried out to eliminate the misconception.

In light of the findings of this study, the following suggestions were made:

1. In this research, it was observed that the conceptual understanding of the students in the post-test was positive in the activities developed according to the DSLM, which includes the climate and other climate-related concepts in the 5th-grade "The Effect of Climate on Our Lives" topic. Various materials can be prepared in different units and their effectiveness can be examined with respect to DSLM.
2. DSLM is a method that is never used in the Social Studies course. By integrating the process into the course, deficiencies in different subjects and learning domains can be identified, and we can correct the deficiencies.
3. The DSLM can be presented by supporting different teaching techniques, such as different materials, analogy, and animation, where visuality and association are at the forefront.

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