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Which Is More Valuable In Constructing Cognitive Structures - Teaching Science Through Creative-Drama Activities Or Student-Centred Inquiry-Based Teaching?

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ABSTRACT
This research aimed to compare the effect of teaching science through-creative-drama activities and student-centred inquiry-based teaching on the cognitive structures of primary school pupils about the classification of living things. It was designed as an exploratory action research case study and the contribution of both interventions on the cognitive structures was explored. The study was conducted on two fifth grade classes at a public middle school in Turkey during the fall semester of the 2017 year. The experimental group was taught science through-creative-drama activities that were integrated into the unit. While in the control group, student-centred inquiry-based teaching was carried out. Data were collected by pre-post open-ended questionnaires and also word association tests for both groups. It has been revealed that teaching science through-creative-drama activities about the classification of living things topic made a significant contribution to the expansion of the schemas in the cognitive structures compared with student-centred inquiry-based teaching. However, it was difficult for the teacher researcher to control the schemas that pupils came up with, some of which promoted misconceptions.

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Introduction

Developing scientifically literate citizens is an objective of science education (Bybee, 1997; DeBoer, 2000). Developing 21st-century skills in children is critical to in order to be able to survive and compete in the globalising world today. Science literacy means understanding the basic concepts and methods of science enough to use them in daily life and individual decision-making and being able to use scientific data. Scientific literacy is defined as “taking responsibility in situations that require an individual's understanding of science and technology, having the necessary knowledge and skills to make decisions that show and take cognitive action (Laugksch, 2000). The American Association for the Advancement of Science [AAAS] (1990) called the scientific literate person "A person who understands the principles, is familiar with the natural world, uses scientific knowledge and method for individual and social purposes”. Based on this definition, scientific literacy is not only scientific knowledge and but also includes the processes of applying this information beyond the understanding of ideas (AAAS, 1993). Individuals with scientific literacy should be able to look at texts with a critical eye and interpret content correctly. In this context, critical thinking and problem solving, accessing and analysing information, information literacy and creativity are among the 21st-century skills (Fadel & Trilling, 2009).

As in other countries, the loss of pupils' interest in science increases in Turkey as the learning level progresses (Aydeniz & Kaya, 2012; Bong et al., 2015). Accordingly, academic achievement in science has become a cause of concern. This situation manifests itself both in the Programme for International Student Assessment [PISA] examination conducted by the Organisation for Economic Cooperation and Development [OECD] and in the university entrance examinations held by the Measuring, Selection and Placement Centre of Turkey. Science literacy is defined within PISA's frames of reference as the ability of pupils to engage in science-related issues and to reflect on scientific facts. These abilities are exhibited by (i) explaining facts scientifically, (ii) designing and evaluating scientific inquiry methods, and (iii) interpreting data and findings scientifically (PISA, 2019). In PISA, pupils are required to conduct experiments. This implies hands-on lab work for the test and interpret the findings inform the reader of the age of the pupils being tested. Turkey ranked 39th among 79 countries participating in PISA 2018 in science, and 30th among 37 of the OECD countries (PISA, 2019; OECD, 2019). One of the possible reasons for this poor performance is seen as the pedagogical approaches that teachers use throughout science education. This has led to much discussion about which teaching approach should be used in school science. It has been argued that more emphasis should be placed on cognitive structures in science (Bahar & Tongac, 2009; Tsai & Huang, 2002).

Cognitive Structure

The concept of cognitive structure describes the manner in which meaningful relationships are established between items in the memory (Shavelson, 1974). There are two basic elements in defining the cognitive structure of a learner, (i) the units of knowledge included and (ii) how they are organised (West, Fensham, & Garrard, 1985). When a concept is associated with other concepts, its meaning in the learner's cognitive structure emerges (Kurt, 2013). In this respect, weak cognitive structures related to science concepts may cause problems during the processing of information. In this meaning-building process, many variables are in play. These include age, educational level, living environment, and personal interests and values.

Studies pertaining to cognitive structure appear to fall into two groups. One group focuses specifically on science concepts. These studies may be directed at biology concepts (e.g., enzymes, viruses, genetics, genetically modified organisms, and most recently, Covid-19) (Donmez & Gurbuz, 2020; Ekici & Kurt, 2014; Gercek, 2020; Kurt, 2013), physics concepts (e,g,, the solar system and outer space) (Ercan, Tasdere, & Ercan, 2010), environmental concepts (e.g., natural disasters) (Tokcan & Yiter, 2017), and chemical concepts (e.g., the Periodic Table) (Varoglu et al., 2020). It has often been revealed that pupils' cognitive structures are limited and sometimes harbour misconceptions. Studies in the second group tend to dwell on how to enrich cognitive structures. Some studies have dealt with different teaching methods and techniques including inquiry- and constructivist-based methods. New methods continue to be studied and there is no consensus as yet concerning the best methods to use to strengthen learners' cognitive structures.

Creative Drama in Science Education

Methods including creative drama have been employed in recent years to enrich the creative thinking ability of children in a way that can encourage creativity, which is among the 21st-century skills (Momeni, Khaki, & Amini, 2017). Creativity or creative thinking arises during infancy and can subsequently be developed by teaching and learning processes. Towards this end, learning environments may adopt cognitive, affective, and psychomotor approaches in which the child will be active in problem-solving and transfer these skills to daily life. Within limits set by the school, the child must be free to solve a problem by dreaming, to plan, to realise the plan, and to evaluate the consequences. Children should build their knowledge by doing science instead of passively recording it in the classroom, after which it will be forgotten. In this process, teachers should be the guide who design the learning environment, initiate the learning process, coordinate and continuously follow up, and provide guidance for the construction of new knowledge at the time of need. One of the methods that best encourages this sequence is accepted as creative drama (Abed, 2016; Braund, 2015).

Creative drama is defined as the enactment of a purpose using techniques such as improvisation and role-playing, based on the life experiences of the members of a group. Although the use of creative drama in science teaching is relatively new, some studies have measured its effect on learning outcomes such as academic achievement and attitudes to science. Creative drama can be used primarily in building the cognitive structure of science-related concepts through the process of scientific knowledge building (Ay & Tokcan, 2019). The current research focused on the cognitive structures of pupils between 11-12 years old concerning the classification of living things by means of an intervention based on creative drama. The unit, called "Let's Travel and Get to Know the World of Living Things" consists of two topics: "Know the Living Things" and the other is "Human and Environment Relationship". It aims for learners to classify living things according to their similarities and differences; to recognise microscopic living beings, fungi, plants, and animals; to gain sensitivity towards environmental problems caused by human activities and gain also knowledge and skills to solve these problems (Ministry of Turkish National Education [MoNE], 2013).

The idea of classifying living things dates back to ancient times. Even then, people were trying to distinguish which animals could be consumed as food, which animals could be hunted, which plants could be eaten, and which were poisonous. The taxonomy, which is used in classifying living things in the light of various principles and factors, provides better recognition of living things. From this point of view, the topic is important in terms of science literacy for the child to make the right decisions while solving the problems he/she may encounter in daily life. The grouping of living things by examining their characteristics is called classification. The branch of science related to this topic is called taxonomy, and the scientist dealing with it is called taxonomist. Although an artificial classification was used in the early times, taking into account the environments in which living things live and their external appearance, today natural (phylogenetic) classification is used. In phylogenetic classification, many features such as DNA similarity, cellular characteristics, anatomical features, physiological characteristics, type of excretory wastes, and embryological developmental stages are taken into consideration. However, analogous organs, chromosome number, and the environment in which they live are not taken into account.

This topic, which is in the fifth grade of the 2013 science curriculum in Turkey, includes concepts as similarities and differences of living things, microscopic creatures, fungi, plants, animals and human-environment interaction (MoNE, 2013). It is recommended to teach science based on an inquiry-based method in the curriculum. Inquiry-based instruction is a pupil-centred approach where the teacher guides the students through questions posed, investigative methods used, and data interpretation. Through inquiry, pupils actively discover knowledge (MoNE, 2013). In this research, the knowledge and experience to be gained from creative drama is integrated into inquiry-based science teaching. This current research can contribute to the field by showing how creative drama can be used as a supportive tool for inquiry-based science teaching and describing possible undesirable situations that may arise in the process.

This research aimed to compare the effect of teaching science through-creative-drama activities and student-centred inquiry-based teaching on the cognitive structures of primary school pupils about the classification of living things. The research question was accordingly as follows:

Does the inclusion of creative drama in inquiry-based science teaching enhance students' cognitive structures better than inquiry-based teaching without creative drama?

Method

This research was designed as an exploratory action research case study. A few studies have already looked at the use of creative drama for teaching and learning science and focused on some learning outcomes. However, the effect of creative drama-based science teaching on the cognitive structure has not been specifically explored. This research focused on the cognitive structure outcomes of an intervention designed within the scope of the human and environmental unit. The researcher, who is also the science teacher of the class, was an active participant in the research, and her goal was to improve science learning through improved teaching; action research is typically designed and conducted by practitioners who want to improve teaching practice (Kucuk, 2002; Kucuk & Cepni, 2005). This research was carried out with two groups of children at the same grade level, one experimental and the other the control group. The content taught was from the "Let's Travel and Get to Know the World of Living Things" unit from the Turkish Science Teaching Programme (MoNE, 2013). The inquiry-based science activities carried out for the three-step approach were combined with the Glasson Learning Cycle (GLC) (Glasson & Rosary, 1993). Both pre- and post- data were collected using a written open-ended questionnaire and a word association test.

Research Subjects

The research subjects were forty-two pupils in two fifth grade (age 11/12) classes at a public middle school in Turkey during the fall semester of the 2017 year. Both classes contained 21 pupils. The researcher, being the school's science teacher, taught both classes. The mean achievement scores of the two classes arising from the first science examination were the same.

The Creative Drama-Based Intervention

The creative drama teaching material was a three-week intervention designed by the researcher, conducted two or four hours a week, for a total of twelve hours. The experimental group received inquiry-based science instruction integrated with creative drama, and the control group received inquiry-based science instruction without creative drama. The researcher has already taught science through creative drama to several classes at the middle levels before conducting this study and has also a creative drama certificate.

The activities carried out for the three-step approach combined with the Glasson Learning Cycle (GLC) are briefly described (Glasson & Rosary, 1993).

Phases of the Glasson Learning Cycle (GLC):

"Preparation-warm-up" phase: This started with formal science lessons. Participants are physically and more involved in the creative drama process. Importantly, they are prepared mentally. It helps them to better focus on the activities when excluded from daily life and identity. The activities, for example, games, music, and metaphors are frequently used. Learning activities involved conventional teacher presentations and worksheets, observation of unicellular organisms with a microscope, examination of the parts of a plant, a poster exhibition, station technique, playing in and/or outside the classroom, calculation of carbon footprint. For example, in the activity of "classifying living things" as a group study, pictures of living things were provided to each group and they were asked to classify them according to the characteristics determined by consultation within the group. A worksheet was used for this purpose. In this material, pupils were encouraged to work together, first to classify and then to write down the answers to some questions to be shared with others. In the first question, they were asked what they paid attention to when classifying living things, how many classes they formed in the second question, and what they named these classes, and in the last question, they were asked to create a concept scheme titled "LIVES" based on their classification. In another activity, parts of a live flower brought to the classroom by the teacher researcher were examined. In this process, parts of the flower such as flower, leaf, stem, and root were taken and examined using a microscope with an LCD screen. The pupils then engaged in in creative

drama activities (e.g., the planning of storyline, characters, and dialogue). They did research, discussed ideas, and tried to dramatise science concepts and ideas.

During the "clarification" of GLC and also in the "animation" phase, the pupils worked actively (e.g., raised questions, developed concept maps, did research) to clarify the meaning of scientific explanations and then constructed new knowledge based on their investigations. Improvisation and role-playing techniques are often used and creativity and originality are exhibited at this stage. The animations can be done individually or in groups of two or three, or with the whole group. In this research, animation was made in groups of four. From there, the pupils formulated their creative drama activity about the environmental problems by relating to living things, wrote a script that can be exhibited in ten minutes, and rehearsed, for the presentation, consequently acted out their drama on the classroom stage. The teacher also shared a basic guideline for creative drama preparation. They are asked to prepare the items to be used in this show at the next lesson.

During the 'elaboration' of GLC and also "evaluation-discussion" phase, following presentations, the teacher asked the class questions about the theme of the presentations, started a class discussion and pupils then had group discussions again to refine their dramas to better reflect scientific views. They made a circle and talked about what they have learned about environmental problems while throwing a ball at each other.

The pupils in the control group, on the other hand, completed all the activities (including indoor and outdoor games) in the plan, except for the preparation for an animation about environmental issues. Instead of this activity, they were encouraged to talk about environmental problems in their groups and to research topics they were curious about from the materials in the classroom library and on the internet. In this way, the teaching process in both groups was completed in a total of twelve hours. However, the data in the current research are related to the classification of living things, which is the first topic of the unit.

Data Collection

The data were collected based upon an open-ended questionnaire and also a Word Association Test (WAT) of classification of living things using both pre- and post-tests. These tests are commonly used to determine individuals' cognitive structures, the connections between the concepts in this structure, and to elicit information networks (Atasoy, 2004; Baptista et al., 2019; Butun-Kar, 2021; Ekici & Kurt, 2014; Derman & Ebenezer, 2020; Kiryak et al., 2021; Timur & Tasar, 2011; Turksever, 2021; Yildirir & Demirkol, 2018). The word test is based on the assumption of answering associated with the stimulus word, regardless of limiting the ideas that come to the mind (Sato & James, 1999). Since the students in both groups were familiar with the word association test, no additional information was required.

(i) The Word Association Test

Pupils were asked to write the first five words that come to their minds for each concept presented, allowing one minute for each one. These concepts were live, vertebrate, snake, microscope, penguin, fly, animal, bat, worm, plant, whale, human, fungus, frog, natural environment, bacteria, sheep, and extinction. When the studies in the literature are examined, word association an average of thirty seconds is given for each concept in the test (Bahar et al., 1999; Bahar & Ozatli, 2003; Kurt et al., 2013; Nakiboglu, 2008; Hovardas & Korfiatis, 2006; Yucel & Ozkan, 2015). Since the sample group of this study was children between the ages of 11-12, a maximum of one minute was given for each key concept in the study. During this time, the students wrote the words they thought were related to the key concept in order and one after the other to prevent the risk of chain answers. Because if they do not return to the key concept in every concept writing, they can write the words as an answer instead of the key concept (Bahar & Ozatli, 2003). This reduces the validity of the test. For the students to allocate equal time to each concept in the test, they were asked to move on to the next key concept after the time given for each concept was over. These were collected for analysis and the intervention started. This test was repeated after the intervention. For example,

Stimulus Word: Live
Word 1:
Word 2:
Word 3:
Word 4:
Word 5:

(ii) The Open-Ended Questionnaire

This test consisted of an open-ended question: "Given a new specimen that they had not encountered before, what kind of information would have to be known precisely to classify it?".

Data Analyses

For the WAT, the frequencies of the concepts that students associated with each concept in the pre-test and post-test were calculated and tabulated. To evaluate the results in the pre-test and post-test, all of the answers given to the key concepts were examined in detail, and in this way, a frequency table was created showing which words or how many times the concepts were repeated for which key concept. Concept networks have been prepared considering this table. To clearly show the cognitive structure and conceptual change, t The cut-off point technique introduced by Bahar, Johnstone, and Sutcliffe (1999) was used in the formation of concept networks. The maximum response given to any stimulus concept in the cutoff frequency table is below a certain value determined by the researcher. Concepts above this value are the first cut of the concept network formed the point. According to this technique; for any key concept in the word association test, the most given answer is used as a cut-off point 3-5 numbers below the word. Answers above this answer frequency are written in the first part of the concept network. Then the breakpoint is pulled down with certain intervals and the process continues until all keywords are found in the concept network. In this study, some cut-off points as 18-20, 15-17, 12-14, 9-11, 6-8, and 3-5 were taken for other concepts associated with the concepts in the test, and the experimental and control pre-post test results were presented by comparing them one to one. The concepts that emerged in each breakpoint interval are repeated as many students in that interval. For example, the concepts that emerged in the 18-20 cut-off range were stated by the students between 18 and 20 as answer words. These concept networks are detailed by data visualization. Concept networks have been created through the prepared frequency table and breakpoints.

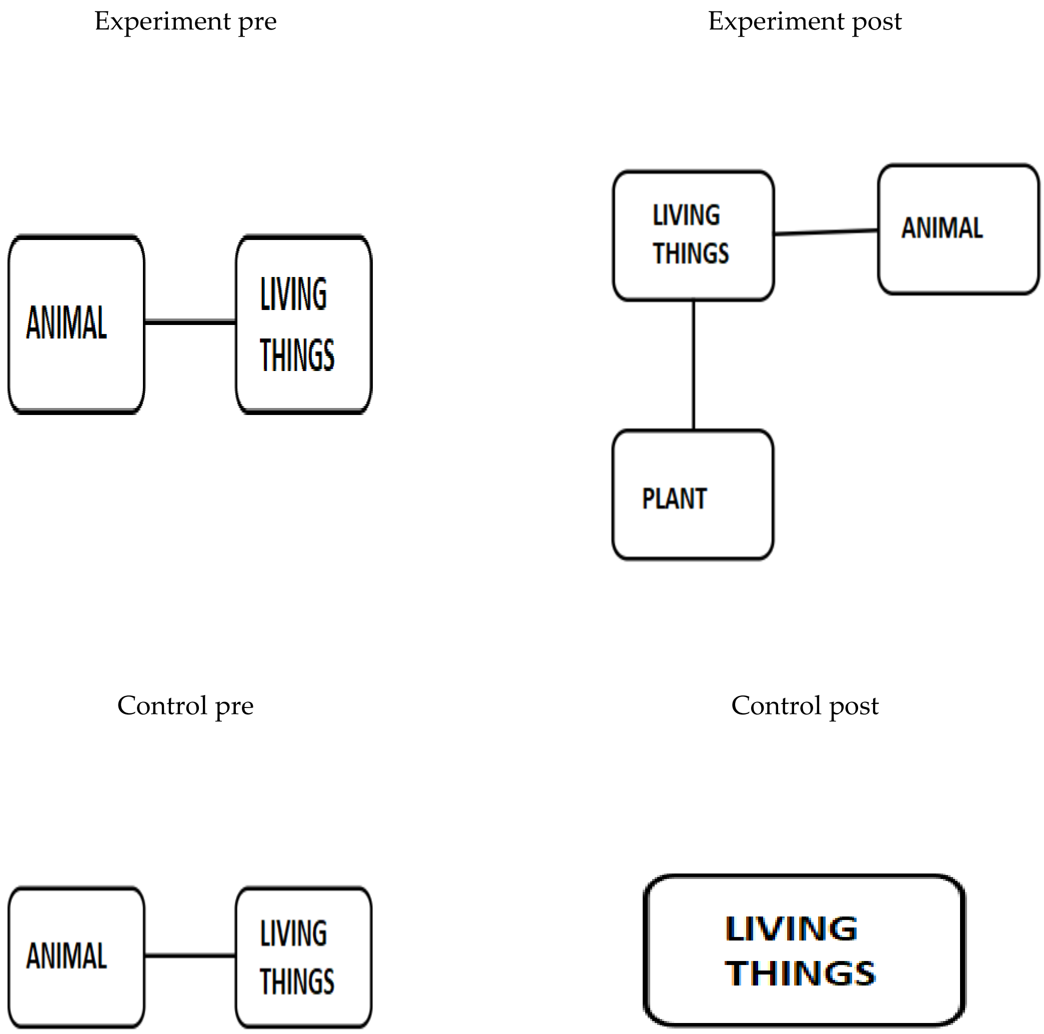
The characteristics sought in the analysis of the open-ended question were categorized under phylogenetic classification. In phylogenetic classification, some features such as DNA similarity, cellular characteristics, anatomical features, physiological characteristics, type of excretory wastes, and embryological developmental stages were used as criteria. These were compared with the help of tables. Each feature written in this process was taken as open codes and placed in phylogenetic categories. In this process, code-category compliance was checked by another expert in science education and qualitative data analysis. In this way, the reliability of data analysis has been established (Cresswell, 2003). In this way, the effect of the intervention on the cognitive structures of the students has become clear.

Results

The WAT Results

Figure 1

Comparison of the Cognitive Structure at the 18-20-Cut-Off Point

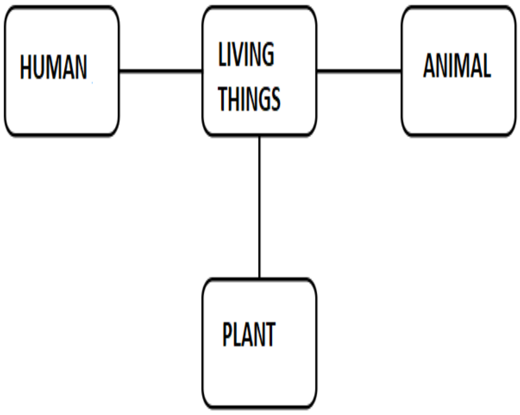


Based on figure 1, it is seen that the majority of the pupils in both the experimental and the control groups matched the concepts of 'life' and 'animal' in the pre-test. In the post- test, the concept of 'plant' is also encountered in the experimental group along with the concept of 'animal.' However, it is seen that the pupils in the control group did not match the concept of a living being with any additional concept in the post-test.

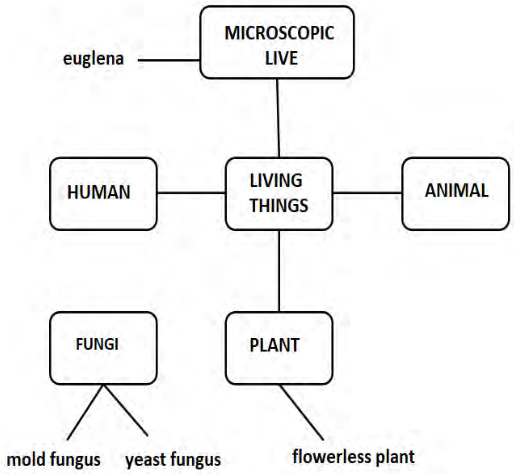
Figure 2

Comparison of the Cognitive Structure at the 15-17- Cut-Off Point

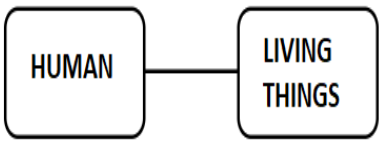
Experiment pre



Experiment post



Control pre



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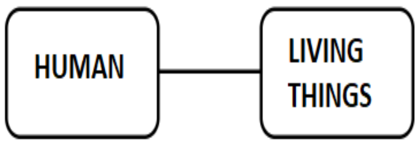
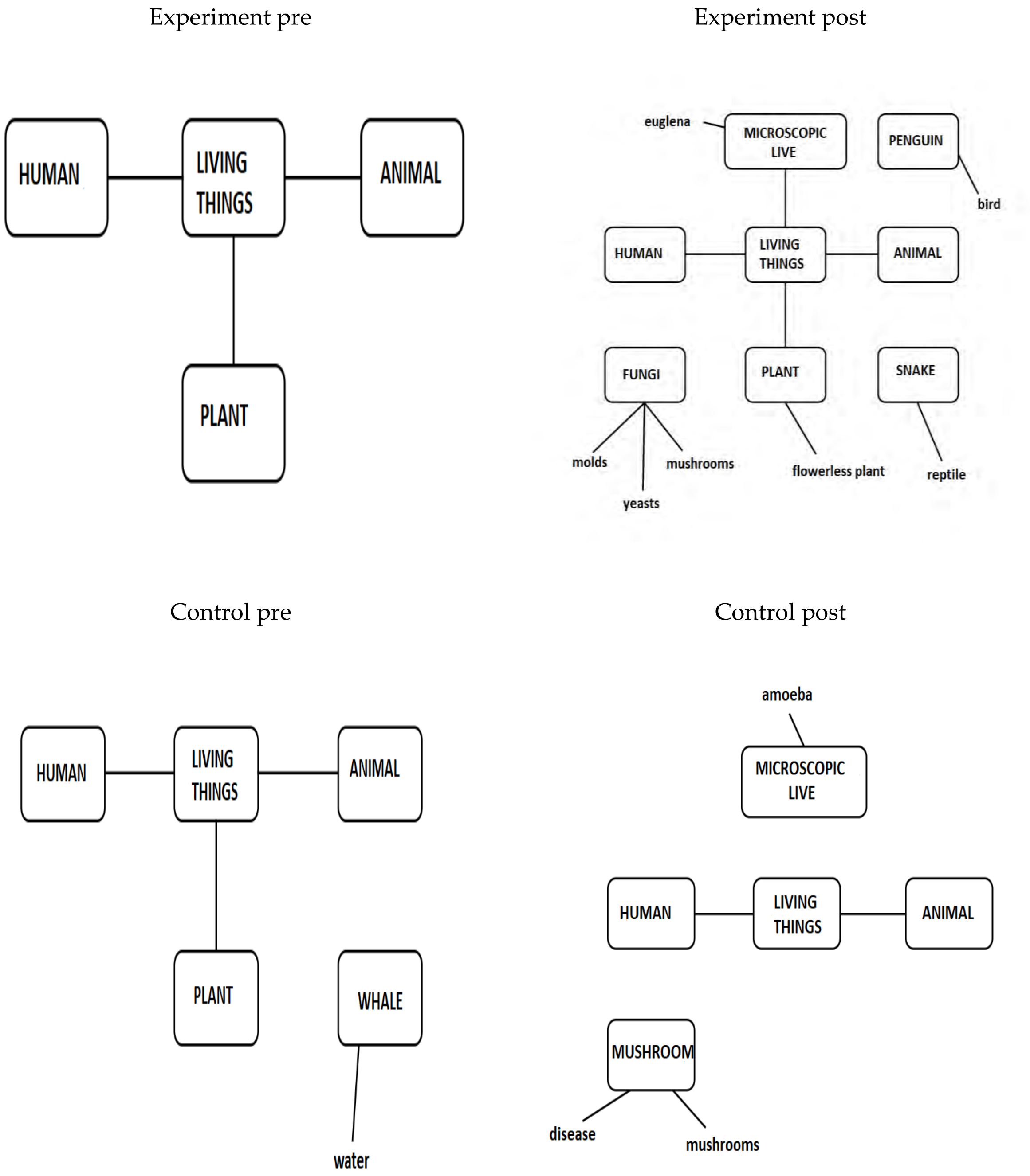


Based on figure 2, the experimental group matched the concept of a living being with the concept of animal, plant, and human in the pre-test, while the control group matched only the concepts of living beings and humans in the pre-test. Looking at the post test results, it is seen that the concept of microscopic living things and fungi has been formed in the experiment group's scheme. They have matched both these concepts and the concept of the plant with other appropriate concepts. The schemes of the control group remained the same as in the pre-test.

Figure 3

Comparison of the Cognitive Structure at the 12-14- Cut-Off Point

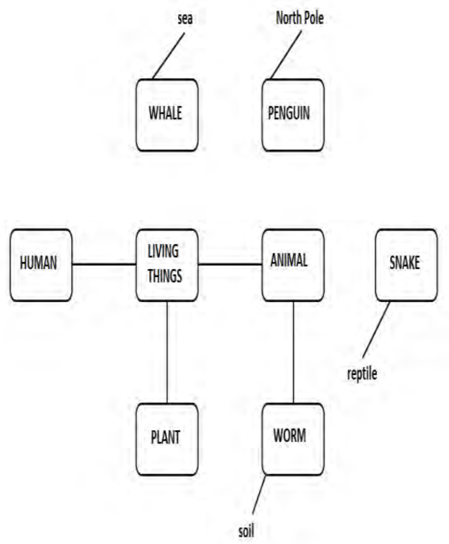


Based on figure 3, it is seen that the pre-test results did not vary while the relationships between concepts increased in the post-tests for experimental group. Pupils were able to match the concept of a penguin with a bird, snake, and reptile. There is a richer scheme in the post-test application of the control group compared to the pre-test.

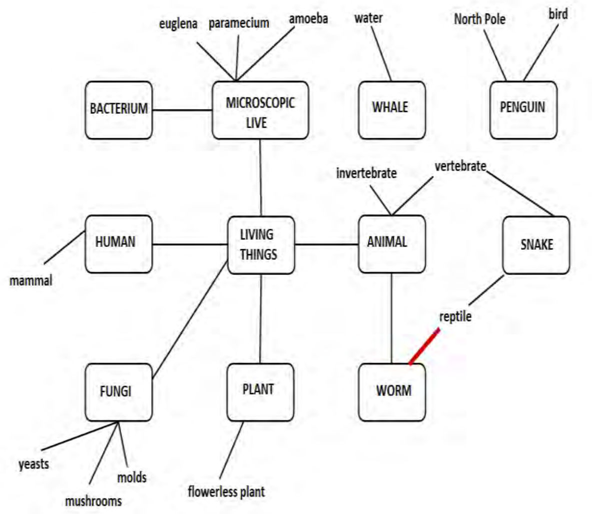
Figure 4

Comparison of the Cognitive Structure at the 9-11- Cut-Off Point

Experiment pre



Experiment post



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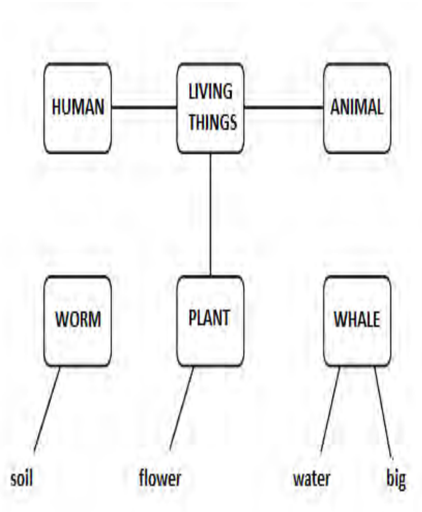

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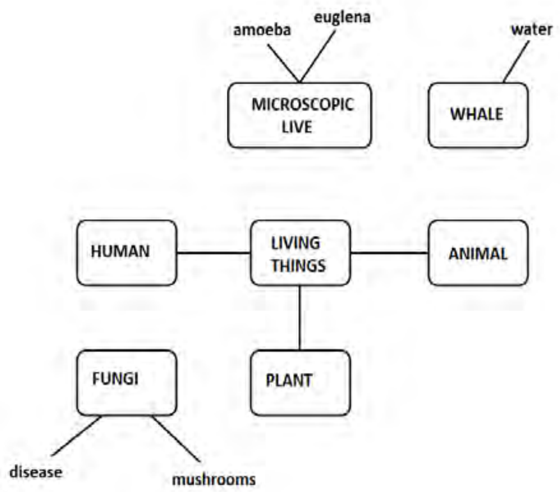
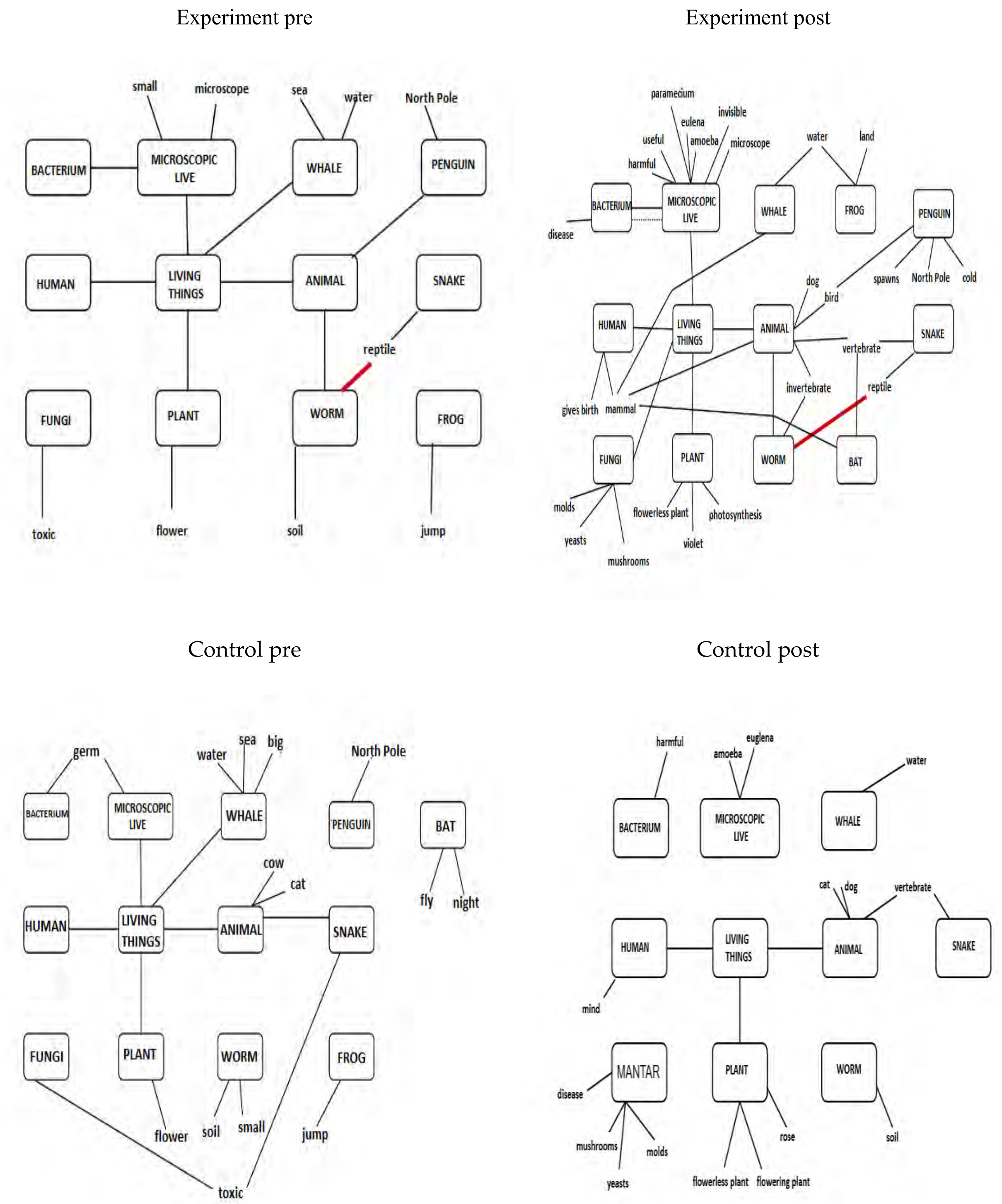


Based on figure 4, most of the key concepts appeared in the post-test in the experimental group. Three microscopic living species are matched with the concept of microscopic living things. Students associated animals with the concepts of vertebrate-invertebrate and related humans with the concept of mammal. However, although it was not found in the pre-test, they mistakenly matched the concept of worm with the concept of reptile. There were minor changes in the pre-test results of the control group compared to the previous interval. The concept of whale, with the concepts of water and great, has also matched with the concept of the flower. Looking at the post-test schemes of the experimental and control groups, it is seen that the conceptual relationship in the experimental group is richer.

Figure 5

Comparison of the Cognitive Structure at the 6-8- Cut-Off Point

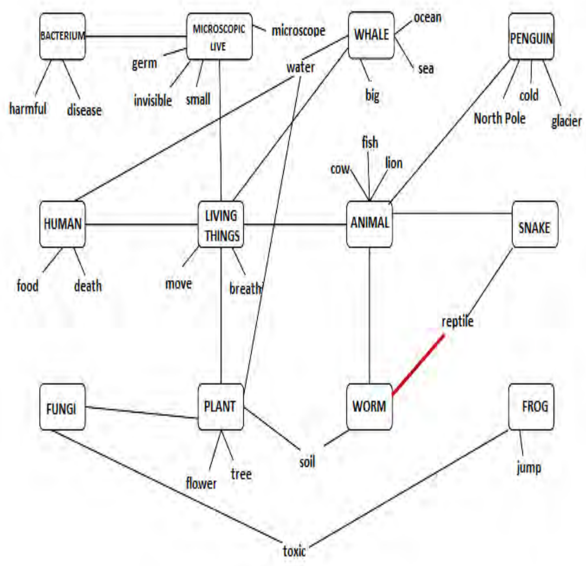


Based on figure 5, the experimental group mistakenly matched the concept of worm with the concept of reptile in the pre-test. In the post-test, they stated that the penguin would lay eggs, microscopic creatures could be beneficial and harmful, and the whale was a mammal.

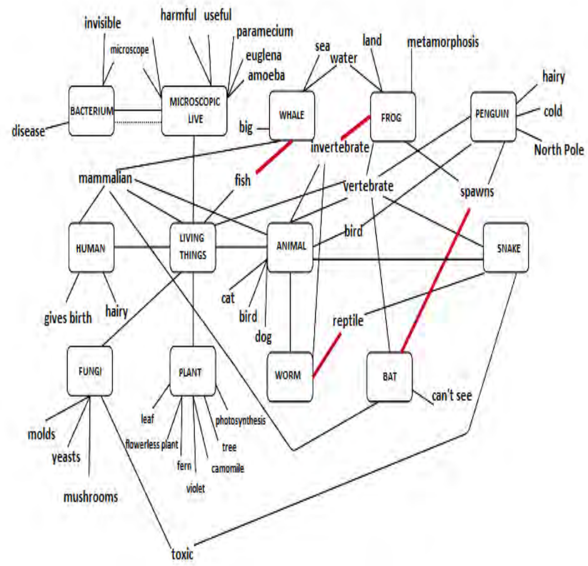
Figure 6

Comparison of the Cognitive Structure at the 3-5-Point Cut-Off Point

Experiment pre



Experiment post



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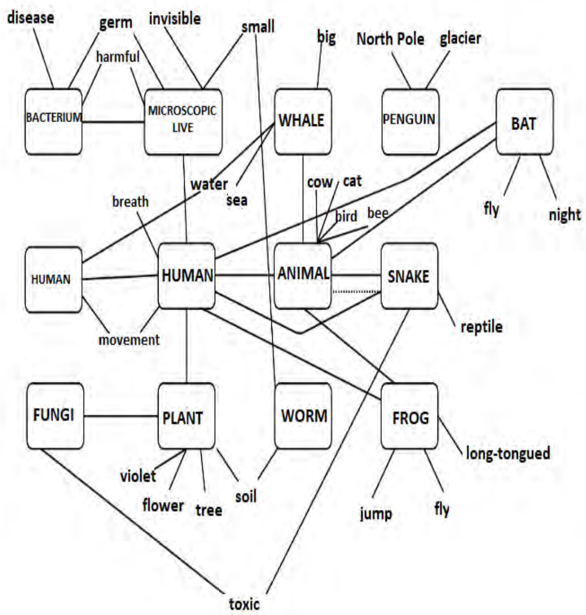
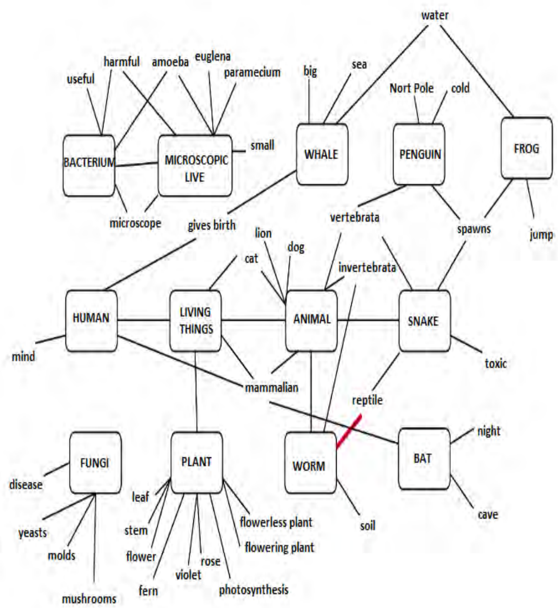


Control post



Based on figure 6, the post-test of the experimental group revealed the misconceptions of the whale being a fish, and the frog invertebrate, which were not seen in the pre-test. In the control group, the worm-reptile error was found only in the post- test. The penguin-bird relationship was moreover not established in the control group.

(ii) The Open-Ended Questionnaire Results

The analysis of the answers given by the pupils for the open-ended question about what information is needed to classify an unknown living thing before and after the intervention is shown in Table 1.

Table 1

Distribution of Information Needed to Classify an Unknown Creature

Classification Criteria	Experimental group		Control group	
	Pre	Post	Pre	Post
Physical Appearance	18	27	21	9
Living Environment	12	6	1	2
Nutrition Style	10	2	3	5
Breeding Pattern	4	14	2	5
Excretion Product	1	-	-	-
DNA and Protein Similarity	1	-	-	-
Anatomical Similarity	1	13	3	8
Biochemical Properties	-	7	-	-
Embryological Development	-	2	-	-
Invalid Answer	13	38	11	29
Total	60	109	41	60

Before the intervention, the experimental group explained that they needed some characteristics such as physical appearance, living environment, nutrition, and breeding style to classify a newly encountered creature. After the intervention, the cognitive structures on this subject changed, mainly physical appearance, reproductive style, anatomical similarity, biochemical characteristics, and lifestyle. On the other hand, while the students in the control group stated that physical appearance should be known at the beginning, then again, with a significant decrease in physical appearance, they first referred to anatomical, feeding, and reproductive patterns. In addition, while the sixty different codes of the experimental group increased to one hundred and nine, the forty-one codes of the control group increased to sixty. On the other hand, the codes produced by the students in the experimental group were considered invalid. In this case, it can be argued that science teaching based on creative drama leads to the expansion of students' cognitive structures and the formation of more codes. Nevertheless, it should be emphasized that depending on the teaching style, this schema expansion in students might have led to an increase in the number of invalid answers.

Discussion

It is known that creative drama is effective with reference to pupils’ academic achievement (Abed, 2016; Batdi & Batdi, 2015; Cokadar & Yilmaz, 2010; Kahyaoglu et al., 2010; Ogur & Bagci-Kilic, 2005; Oguz-Namdar et al., 2018; Ormanci & Ozcan, 2012; Taskin-Can, 2013; Timbil, 2008; Timothy et al., 2014; Tuncel, 2009; Unuvar, 2007; Yagmur, 2010; Yalim, 2003; Yilmazlar et al., 2013), promoting conceptual change (Alkhawaldeh, 2007; Baskan, 2006; Braund, 2015; Ceylan et al., 2015; Danckwardt-Lillieström et al., 2020; Francis, 2007; Hendrix et al., 2012; Meseci et al., 2013;), pupil interest, attitude and motivation (Abed, 2016; Cokadar & Yilmaz, 2010; Hendrix et al., 2012; Oguz-Namdar et al., 2018; Ong et al., 2020; Ormanci & Ozcan, 2014; Timothy et al., 2014), and the development of scientific process skills (Taskin-Can, 2013) and critical thinking skills (Yagmur, 2010; Yilmazlar et al., 2013). Some studies revealed that creative drama can also be used as an effective tool in eliminating misconceptions (Baskan, 2006; Ceylan et al., 2015; Yesiltas et al., 2017). In this study, the effect of an intervention programme incorporating creative drama teaching on the cognitive structure of the pupils in the context of the topic of biological classification was ascertained.

As expected, the teaching based on the GLC Model (Glasson & Rosary, 1993) within the scope of the human and environmental topic led to the formation of more schemas in the pupils' minds in terms of the targeted concepts compared to the other. The experimental group started to use more intense concepts (see figure 1-6). This situation is also encountered in the analysis of the data obtained from the questionnaire, in which the characteristics that must be known in the classification of living things are posited (see table 1). Although the features used in the classification of the experimental and control groups were not shared by the researcher on a scientific basis, the pupils were able to use both the activities performed in the classroom (for example, group work-based classification studies based on the ready-made visuals, the examination of the parts of the flower and of course, the creative drama studies conducted in the intervention group) towards making significant gains in learning outcomes. However, a problem was noticed in the form of misconceptions arising. For example, the misconceptions that the whale is a fish and that the frog is an invertebrate was not encountered in the pre-tests for the experimental group but emerged in the post- test results (see figure 6). The misconception that worms are reptiles persisted. One possible reason for this may be that pupils who are confronted with or produce a number of new concepts in a short time may fail to learn the meaning of the concepts in a sufficient depth. Another reason is that the teacher fails to give effective feedback on time during this conceptual development process. The meaning of the concepts used during creative drama presentations is integrated into the cognitive structure without being questioned. Studies are supporting the result of the research in the literature on this subject (Ong et al., 2020; Ceylan et al., 2015). To solve the possible problems that may arise in this regard, the teacher should check the proposed scenarios so that possible mistakes can be corrected or removed from the script. Otherwise, the uncontrollably expanding cognitive structure may inevitably create new problems that are difficult to rectify in the future (Atasoy et al., 2011; Bacanak et al., 2004; Kucuk, 2005; Kucuk et al., 2005; Sen et al., 2019). The misconceptions adopted by pupils in the early stages of schooling are very difficult to correct even with well-structured teaching in the following years.

Conclusion

It has been revealed that science teaching based on creative drama and inquiry within the human and environmental unit of the Turkish Grade 5 science curriculum made a significant contribution to the expansion of the schemas in the cognitive structures of the students in the experimental group. However, it is difficult for a teacher to control the schemas that expand considerably in a short time as an output of creative drama scenario presentations that encourage pupils' creativity, and pupils may start to use some concepts that have not learned in sufficient depth thereby developing misconceptions. To prevent this, it is necessary for the teacher to examine the creative drama scenarios proposed by the pupils before the presentation and to intervene in issues that may give rise to errors for both the presenter and the audience. Nevertheless, even this may not eliminate some of the wrong learning that occurred as a result of the sharing of students in the group during the preparatory work for creative drama presentations.

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