



MISCONCEPTIONS OF THIRD GRADE STUDENTS IN TERMS OF CONCEPTS SUCH AS FORCE, MATTER, LIGHT AND SOUNDⁱ

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Abstract:

The purpose of the study is to ascertain misconceptions of students at 3rd grade of primary schools in respect of concepts such as force, matter, light and sound. The study was conducted at a primary school located in the province of Ordu, district of Unye, Turkey. Data was analyzed using descriptive analysis method at this study conducted with the qualitative research method. As the data collection tool, a test for ascertaining misconceptions calculated as Cronbach Alfa coefficient 0.673 (KYBT), developed by the researcher as well as a semi-structured interview form were used. KYBT including 12 questions were posed to 30 3rd grade students. Also, interview studies were conducted with 8 students. Misconceptions included in answers given by students to test questions are shown in tables. Data derived from interview forms was analyzed with descriptive analyses and results were given in tabular form. According to data derived, misconceptions of students regarding the subject of force, direction change, deceleration and acceleration, and dangers posed by moving objects to humans. With regards to the matter, misconceptions such as ability to distinguish certain liquids by touching and hardships in understanding were ascertained in connection with features characterizing the mater. When it comes to the light and sound, sources of natural and artificial sound, relation between the severity of sound and the distance as well as sources of sound that could lead to loss of hearing losses, high level of misconceptions and hardships in understanding were identified. However, although a few students think that, in connection with the force, taking a photo can move objects, there is almost no misconception with regards to concepts such as pushing-pulling. When it comes to the matter, there is too little misconception about distinguishing matters by their odors, matters that can cause damage if smelled and classification of matters by their forms, and, with regards to the sound, about hearing of the sound. In particular, it was understood that answers given for questions about abstract concepts are correlated with the wrong or incomplete experiences in the daily life. In this sense, for the purpose of teaching of

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concepts connected with the science education or life sciences to be offered at the primary school, it is suggested that perceptions, misconceptions and understanding difficulties relating to abstract concepts in particular be ascertained and that curriculums, course sources and other teaching materials be developed based on such data so derived.

Keywords: life sciences, force, matter, sound, light, misconception

1. Introduction

Science and technology that advance and change steadily in today's world made it imperative for countries to constantly revise their education curriculums to keep pace with such change. Now, societies need individuals who think, criticize, are constructive, creative, productive, exploratory, active, constantly change and renew themselves apart from individuals possessing the knowledge. Therefore, curriculums should be re-structured in line with raising individuals with such characteristics (Kaptan and Kuşakcı, 2002). In this context, science programs are being renewed and put into practice in line with requirements.

An effective science education can be possible only if students are encouraged for meaningful learning of concepts instead of rote learning (Gençer, 2006; Altıparmak and Palabıyık, 2017). Otherwise, the knowledge learnt, i.e. memorized does not last long in the mind and new concepts are not properly established in the student's cognitive structure (Yıldırım, Yalçın, Şensoy and Akçay, 2008). Therefore, concept teaching has an important role in subjects of life sciences where many concepts are abstract (Bacanak, Küçük and Çepni, 2004). The concept of science can be described as the process of examining in a purposeful and planned manner, researching, testing, distinguishing-integrating functioning and orderliness around the man's natural environment within new connections and the whole of safe information acquired in that way (Yağbasan ve Gülçiçek, 2003). The concept can be described as the first association in the mind when any object is mentioned (Çepni, 2005, p. 176). In other words, the concept is the term which is cornerstone of the knowledge and enables humans to classify and organize what they learn (Karakuyu, Uzunkavak, Tortop, Bezir and Özek, 2009). Nuhoglu (2008) suggests that events experienced by children in the daily life make them create their own concepts and interpret scientific concepts in their own way and ascribe meaning to them. These instinctive beliefs are given different names such as "preliminary concepts", "alternative concepts", "misconceptions", "scientific instincts of children", "children's science", "general sense concepts" and, finally, "self-generated knowledge" (Eryılmaz and Tatlı, 2000; Kuru ve Güneş, 2005). The term "misconceptions" will be used hereinafter in this study.

When studies on identification of misconceptions conducted in connection with concepts included in life sciences curriculum are examined, it is observed that there are not sufficient studies of that sort conducted for 3rd grade level, yet there are studies conducted mostly for the level of 5th, 6th, 7th and 8th grade levels (Aydoğan and Köksal,

2017). For that reason, given the need for studies for 3rd grade level, a study was conducted among 3rd grade students with regards to concepts such as “force, matter, light and sound.” In this context, CansüngüKoray and Bal (2002), with their study entitled “Misconceptions of 5th and 6th Grade Students Regarding Light and Speed of Light and Shapes for Formation of Such Concepts” and Çakır and Uludağ (2019) with their study entitled “Identification of Knowledge of Preschool Children in connection with the Concept of Light” identified misconceptions related to the light, Demirci and Efe (2007), with their study entitled “Identification of Misconceptions of Primary School Students Regarding Sound” established misconceptions relating to the sound, Nuhuğlu (2008), with the study entitled “Evaluation of Knowledge of Primary School Students Regarding Movement and Force” ascertained misconceptions relating to the force; Erdem, Yılmaz, Atav and Gücüm (2004), with their study entitled “Research on Students' Understanding Levels of the Subject of Matter, Misconceptions, Their Attitudes Towards Science and Their Level of Reasonable Thinking” and Çelikler and Kara (2016), with their study entitled “Identification of Availability of Secondary School 5th Grade Students in terms of Level of Associating Information at the Unit on Change in Matter with the Daily Life” and Coşgun and Karamustafaoğlu (2017) with their study entitled “Thoughts of Primary School Third Grade and Fourth Grade Refugee Students Regarding the Concept of Matter” established their misconceptions with regards to the subject of the matter.

Misconceptions may be due to failure to fully understand knowledge derived during the daily life (Canpolat and Ayyıldız, 2019) or due to the formal education. Besides, since concepts included in the science are generally abstract, students have a hard time in understanding such concepts (Özalp and Kahveci, 2011; Başar and Göncü, 2018).

Since misconceptions deter the permanent and meaningful learning to a great extent, misconceptions of students have to be ascertained and such misconceptions have to be removed, before the learning process can be initiated, in order to assure the permanent learning (Atılboz, 2004; Köse, Kaya, Gezer and Kara, 2011; Bozan and Savaş, 2019). For studies conducted for establishment of misconceptions and level of understanding, methods such as concept mapping, interviews, drawings, tests are used (White and Gunstone, 1992, akt; Çalık and Ayas, 2003; Aydoğan and Köksal, 2017).

The purpose of this study so conducted is to ascertain misconceptions in respect of concepts such as force, matter, light and sound taught at the 3rd grade of primary schools. Since there are not sufficient studies on the subject matter conducted for the 3rd grade of the primary school, it is believed that findings to be derived from this study will help fill the gap in this field.

2. Method

This study aiming to ascertain views of 3rd grade students at the primary school was structured using qualitative research methods and techniques. Qualitative researches are defined as researches whereby data collection methods such as observation, interview

and document analysis are used, and a qualitative process is followed in order to reveal perceptions and events in the natural environment in a realistic and holistic manner (Yıldırım and Şimşek, 2013). Findings derived at the end of interviews were analyzed using descriptive analysis method, assessed and itemized by taking sub problems as criterion. The descriptive analysis makes it possible to arrange data based on themes resulting from research questions and present them by taking into consideration questions used at interview processes (Yıldırım and Şimşek, 2013). Accordingly, test for identification of misconceptions so developed and semi-structured interview form were used in our study.

2.1 Sample of the research

Sample of the research consists of 153 students studying at the 3rd grade at FevziÇakmak Primary School and Toki Ömer Çam Primary School, in the province of Ordu, district of Unye, Turkey. In order to ascertain reliability of the test for identification of misconceptions (KYBT) so developed, (123) students were involved. Remaining (30) students were involved in the main studies. Also, interview studies were conducted with 8 of 30 students who were involved in the main study.

In Turkey, children must be 69 months old (5 years 9 months) before they can attend the primary school. In this scope, the age range of the sample group involved in the study is 8 to 9 years of age. Thus, working with students at the said age group entails a very difficult process. In this sense, when looking into studies for misconceptions, it is understood that such studies were conducted with older groups to a great extent.

2.2 Data collection tools

For the purpose of the research, the researcher developed a test for identification of misconceptions in order to ascertain misconceptions of students in respect of concepts such as "force, matter, light and sound". Also, a form was developed to conduct semi-structured interviews. The semi-structured interview form was evaluated by 3 specialist lecturers. Specialist opinion was taken for "scope validity" of the draft interview form created by reviewing the relevant literature in accordance with objective and sub-objectives of the study.

2.3 Development of the test for identification of te misconception (KYBT)

- In order to develop a multiple-choice measurement tool for use at the study, first, concepts associated with the subject were ascertained. The said concepts were taken from "Science Class Curriculum for Primary Education Institutions (primary schools and secondary schools) (grades 3, 4, 5, 6, 7 and 8), as published by the Ministry of National Education (MoNE), Head Council of Education and Morality (URLL-1).
- The literature concerning the subject was reviewed and current misconceptions were detected, making use of views of teachers teaching at the 3rd grade. It was revolved that parts of such misconceptions consistent with grade levels be used

for the test. Apart from one correct choice, these misconceptions were inserted in the remaining choices of the test.

- A mark table was prepared in order to prepare a KYBT.
- In line with the mark table so prepared, a question pool consisting of 15 questions and 3 choices (A-B and C), consistent with their levels, was created, and such question pool was submitted to 2 Science teachers and 2 lecturers specializing in science from the University of Giresun and the validity study was conducted.
- The test so prepared was, first, applied to a student group of 10 who never participated in the study. Very simple and very difficult questions students had a hard time in understanding as well as printer's errors were corrected.
- Some questions were revised as a result of preliminary implementation and expert opinion, and a few questions were removed from the test and the test consisting of 12 articles were finalized.
- The test was applied to 123 students in order to calculate reliability of the test which was finalized. Results derived are given in Table 1.
- Of the test questions, questions 1, 2, 3 concern the concept of Force, questions 4, 5, 6 and 7 concern the concept of Matter, whereas questions 8, 9, 10, 11, 12 concern concepts of Light and Sound.

Table 1: Results of reliability

Cronbach Alfa	Cronbach Alfa according to the standard items	Number of items
,673	,674	12

- Finally, the test of which validity and reliability were calculated was applied to 30 individuals for the main study and misconceptions were ascertained.

2.4 Development of semi-structured interview

Interviews are generally classified as structured, semi-structured and non-structured interviews (Yıldırım and Şimşek, 2013). In this study, semi-structured interview studies were conducted for in-depth discovery of students' knowledge regarding concepts. In this context, 7 questions were prepared and expert opinion was taken. Questions prepared included multiple-choice questions, open-ended questions and questions requiring drawing of a shape. Questions were printed out and such printouts were handed over to students during the interview. Students were asked to mark choices, fill in the blanks and draw shapes, when necessary, depending on question types on the form. According to test data, the test was applied to 8 students demonstrating low, medium and high achievement for a period of 15 minutes.

2.5 Data analysis

The qualitative analysis method was used for analysis of tests and interviews. Misconceptions derived from KYBT questions were given in tabular form after calculating their percentage and frequencies. Also, a code was assigned to each student

from 1 to 30. Thus, codes of students were written next to misconceptions marked by every student on the test. Owing to such codes, it was made possible to compare data derived from the test and results of the semi-structured interview in a more meaningful manner and to evaluate them from a holistic point of view. Studies on misconceptions highlight importance of such studies. Descriptive analysis method was used for the purpose of analyzing interview questions. Students' own sentences, as they were given in answers to questions, were used and illustrated exactly. Results of the interview so derived are given in the part of findings.

3. Findings

In this part, answers given to the test prepared for students' misconceptions regarding subjects "let's learn about the force, let's learn about the matter and lights and sounds around us" as well as answers given to interview questions were examined.

3.1 Findings derived from KYBT

Percentage and frequencies of answers given to items included in the test for identification of misconceptions were given in this part. Numbers of questions associated relevant concepts, question roots pertaining to every question, misconceptions in answers given as well as frequencies and percentages of the same were listed in the table with names of concepts researched being in the first column.

Table 2: Frequency and Percentages of Misconceptions so Identified

Concept	Question Number	Question Root	Misconceptions	Frequency	%
Errors Related to the Concept of Force	1	Acceleration, Turning, Deceleration	A car approaching to the red light changes its direction	7	23
			A motorbike entering the curve accelerates An apple starting to drop from the tree changes direction	11	36
	2	Pushing-Pulling Force	Objects cannot be moved by pulling.	6	20
			Objects cannot be moved by pushing.	5	16
	3	Dangerous Results of Moving Objects on Humans	It is not dangerous to try to stop a huge snow mass descending from the mountain.	10	30
			Sudden braking of a speeding car will not give rise to any dangerous results	12	40
Errors Regarding the Concept of Matter	4	Structure of the Matter	Characterizes balls as soft, smooth and non-fragile.	10	33
			Characterizes cookies as soft, smooth and non-fragile.	8	26
	5	Distinguishing Matters by Odor	We may distinguish water or rose from other matters using our sense of smell.	8	26
			We can distinguish matters such as water and glass by their odor.	4	13
	6	Distinguishing Liquid Matters	The flour which is used in the daily life is an example of the liquid form of the matter.	4	13

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		by Odor	The matter inside the propane cylinder we use in our houses is in liquid form	5	16
	7	The harm that can be inflicted by sniffing on living creatures	Sniffing or touching flowers such as rose can cause harm on the body of living creatures. Sniffing newborn babies can cause harm on the body of living creatures.	2	6
Errors Regarding Concepts of Light and Sound	8	Distinguishing Natural and Artificial Sources of Light	The sun is the largest man-made artificial source of light.	5	16
			A flashlight is one of the natural light sources that generate its own energy in the nature.	9	30
	9	Distinguishing Natural and Artificial Sources of Sound	Mistakes natural sources of sound for artificial sources of light.	15	50
			Is not properly familiar with natural sources of sound.	3	10
	10	Change of the Sound Intensity	As distance to the source of sound increases, so does the severity of the sound.	11	36
			There is no change in the severity of sound we hear with our ears, whether close or distant.	10	33
	11	Hearing of the Sound Depending on Proximity and Distance	As distance to the source of sound increases, the sound is heard better.	7	23
			The sound spreading to all directions from source of the sound, first, reaches objects close to the ground.	2	6
	12	Factors Causing Hearing Loss	Only the sound of an aircraft, from among sounds in the nature, can cause hearing loss in the human ear.	7	23
			Sound of a lightning and birds can cause hearing losses in the human ear.	14	46

When examining the Table 2, misconceptions of students based on questions and frequency and percentages are seen. Accordingly, when looking into misconceptions related to the concept of force, it is seen that 23% of students have a misconception that the car approaching to the red light will change directions and 36% of students have a misconception that the motorbike will accelerate at curves and the apple dropping from the tree will change direction. It is seen that 5 students, corresponding to 16%, as the lowest rate, have a misconception that objects cannot be moved by pushing. The fact that the rate of students who have a misconception that a car suddenly braking will not give rise to a danger is 40% with 12 students is striking. When it comes to misconceptions relating to the concept of matter, it is seen that 10 students corresponding to 33% have misconceptions regarding the matter, 26% of students have a misconception that water can be distinguished by sniffing just like a rose, and 2 students corresponding to 6%, the lowest rate, have a misconception that sniffing can be harmful for humans. When it comes to concepts of the light and sound, 15 students corresponding to 50%, with the highest rate, mistake concepts of natural and artificial sound for one another, and the rate of students thinking that the sound will reach objects close to the ground is the lowest with 6%. It was shown that 14 students corresponding to 46% have a misconception that the

sound of the lightning and birds may cause hearing loss. These data show us that young children interpret concepts based on their experiences in the daily life before they were given a proper science education.

3.2 Findings derived from the semi-structured interview

Interview findings were derived by asking 7 questions to 8 students. Findings derived from students, based on subjects, are as follows.

With regards to the subject "Let's learn about the force", following misconceptions have been discovered: "It is dangerous to catch a ball rolling on the ground, and we may put ourselves in danger by stepping on the ball if we do not see it, moving objects do not harm living creatures, and a child trying to catch a piece of paper flying in the air can be in danger."

With regards to the subject "Light and sound", there are following misconceptions: 'sounds made by humans are natural sounds. It is necessary to hit objects to make an artificial sound, and the guitar is not natural since it plays music. Even if the man sings a song (music), his voice can be artificial sound, since the sound of the guitar is low, it is a source of artificial sound, since the ambulance is moving, its sound reaches us a lot earlier, the sun is the largest man-made source of light among beings in the world, and the light is not necessary for us to see objects around us, the light does not spread in the daytime.

With regards to the subject 'let's learn about the matter', students have conceptions such as 'we may distinguish the cologne and bleach by touching both, we may distinguish the bleach by tasting it, but we may have nausea if we do so, if we pour bleach into our mouth, our mouth will be white, it is harmful, we may distinguish it by touching or sniffing it.

4. Discussion and Conclusion

When findings derived from the research are evaluated, it was observed that students have difficulty in understanding concepts such as force, matter, light and sound and they have some misconceptions. Findings so derived are discussed below based on questions pertaining to relevant subjects.

When the test on identification of misconceptions is examined, questions 1, 2 and 3 concern the concept of force.

When looking into question 1, it was observed that 59% of students have difficulty in understanding concepts such as direction change, deceleration and acceleration. It was ascertained that students have misconceptions such as "a car approaching to the red light can change direction, a motorbike entering a curve can accelerate, the sun can slow down, an apple dropping from the tree can change direction." Similar expressions are also found in the dissertation study by Zeybek (2007). Reason for such mistakes could be misconstruction and incomplete interpretation by students of observations in the daily life, Canpolat and Ayyıldız (2019) use similar expressions in the study conducted by

them. For instance, students might have the idea that, if the apple on branch of a tree turns due to the wind, the apple might change direction and drop whilst falling down on the ground due to the effect of the gravity. It is observed that difficulty in understanding related to such concepts is less in interview findings in comparison to the test. It is because students interpreted events in greater details during the interview and, possibly, reached the right conclusion while interpreting.

When the question 2 is examined, most (64%) of the students made no mistake about concepts of pushing and pulling. However, some students have misconceptions and a difficulty in understanding such as the action of 'taking a photograph' can move objects. The reason for such mistake could be not being able to understand what one reads (Bozan and Savaş, 2019).

For question 3, it is observed that most of the students (70%) have a misconception and a difficulty in understanding about dangers of moving objects on humans. Most of the students expressed that catching a moving ball that rolls on the ground could be dangerous and that they can put themselves in danger by stepping on the ball. Likewise, in the interview findings, they said that they could trip over a stone and fall while trying to catch a leaf falling from a branch. The reason for such difficulties in understanding is the idea that dangerous situations can happen without contacting objects, not the mass of object.

Questions 4, 5, 6 and 7 of the test for identification of misconceptions are about the concept of matter.

When the question 4 is examined, misconceptions regarding properties characterizing the matter were discovered in 59% of students. Students expressed that the ball is soft in this context, whereas the cookie is not smooth and fragile. The reason for this mistake made by students could be that they did not understand the question root and what they wanted most was the ball or the cookie. Another reason could be insufficiency of their daily life observations with regards to properties characterizing the matter. These findings are parallel to the study by CoşgunadKaramustafaoğlu (2017) and the study by Leblebicioğlu (2012).

When the question 5 is examined, most of the students (61%) made no mistake about distinguishing matters by their odor. However, some students think that the water and the glass can be distinguished by the odor. Such findings are parallel to studies by Çelikler and Kara (2016) and Orhon (2010). The reason for such mistake is that students may have encountered water that has deteriorated or smells bad due to pollution.

When the question 6 is examined, the vast majority of the students (71%) make no mistake about classification of matters based on their forms. However, some students think that the flour and propane cylinder used in houses might be liquid. The reason for this mistake made by students is that they may believe that the flour is liquid because it does not have a specific form (Çelikler and Kara 2016). Also, since they are unable to see what is inside the propane cylinder, they might have the impression that it is in liquid form. Çakır (2005) conducting a study on the matter established a similar misconception such as "the powder sugar is liquid since it has no specific shape."

When the question 7 is examined, almost all of the students (88%) have no misconceptions regarding matters that can harm living creatures when sniffed. However, when the question of the interview regarding this subject is examined, students make mistake like liquids such as the bleach, cologne and glass cleaner can be distinguished by touching. Çelikler and Kara (2016) discovered similar results with the study conducted by them. Also, some students expressed that they can distinguish the bleach and cologne by tasting them, whereas others express that tasting such liquids may give them nausea. The reason for these mistakes is that they are not familiar with some matters which can cause humans or they are unable to figure out that such matters can give rise to dangerous results for humans. The reason for this could be said to be insufficiency of methods and techniques used for teaching abstract concepts (Yurd and Olgun, 2008; Saraç, 2017).

Questions 8, 9, 10, 11 and 12 in the misconceptions test concern concepts of light and sound.

When the question 8 is examined, misconceptions regarding the concept of light were discovered in 46% of students. Students make mistakes such as "The sun is the largest man-made artificial source of light, a flashlight is one of the natural light sources that generate its own energy in the nature." Also, when students were asked to give more detailed ideas on the subject during the interview, there are misconceptions such as "the light does not spread in the daytime, the light is the flashlight, the light is an instrument illuminating a place, and we do not need light to see objects around us". Such findings were also encountered in the studies by Çakır and Uludağ (2019), Cansüngül Bal and Koray (2002) and Büyükkasap, Düzgün and Ertuğrul (2001). The course books used in our country do not have a clear and specific definition of the light, which causes students to use a lot different expressions when talking about the light (Cansüngül Bal and Koray, 2002). This may also mean that students come up with these descriptions based on inferences from events observed by them during their daily lives, technological instruments used by them or their toys.

When the question 9 is examined, it was ascertained that 60% of students have misconceptions regarding sources of natural and artificial light. When the interview question on sources of light was examined, more detailed conclusions on such mistake were drawn. Students make mistakes such as "sounds made by humans are natural sounds, It is necessary to hit objects to make an artificial sound, and the guitar is not natural since it plays music and even if the human sings a song, the (music) sound may be artificial, and since the sound of the guitar is low, it is source of an artificial sound." Reason for these mistakes could be the idea that the sound will be artificial if you hit objects a lot or little. Similar findings were encountered in studies by Beaty (2000, akt; Okur, 2009).

When the question 10 is examined, it is observed that most of the students (69%) have a misconception and a difficulty in understanding about the correlation between the severity of sound and distance. Students make mistakes such as "as the distance to the source of sound increases, so does the severity of the sound, there is no change in the

severity of sound we hear with our ears, whether close or distant." When findings of the interview are examined, thoughts such as "since the ambulance is moving, its sound reaches us a lot earlier" were observed. The reason for these mistakes could be the thought that severity of moving objects' sound is higher and they reach us a lot earlier. Also, the reason could be knowledge she/he hears from her/his mother, father and others which the child interprets in her/his own way. Hrepic (1998, akt; Okur, 2009) who conducted a study on the sound discovered similar mistakes such as "the speed of the sound depends on the movement of the sound source."

When the question 11 is examined, a vast majority (71%) of students made no mistake about hearing of the sound. However, there are mistakes such as "distant sounds do not reach us, rather, they spread to other places, the sound spreading to all directions from source of the sound, first, reaches objects close to the ground." The reason for such mistakes could be the knowledge students acquire with their own senses which they interpret (Canpolat and Ayyıldız, 2019). In this context, students might think that spreading of the sound could take place just above the ground.

When the question 12 is examined, it was understood that a vast majority of students (69%) have misconceptions and a difficult in understanding sources of sound which cause loss of hearing. Some students believe that only the sound of an aircraft could harm the human ear, while others think that the sound of the lightning and birds could harm the human ear.

Also, students were asked, during the interview, to share their thoughts about the life sciences class and if they wanted to take this class at all times, and a vast majority of students expressed that this class could be fun and they also wanted to take this class at all times.

Following conclusions were drawn in the light of foregoing discussions.

Most of the young 3rd grade students who are to take science education for the first time have misconceptions about the aforesaid concepts. In this sense, a great care should be taken for the science education of children at this age group.

It was discovered that students at this age group in particular answered questions about concepts that are part of life sciences, which they personally experience in the daily life, based on situations observed by them or their experiences in the daily life. As a result, numerous mistakes were ascertained.

Since they pass through the phase of abstract transactions, it was discovered that children misinterpret concepts such as sun-light which they are unable to discover with experience, yet they can only observe based on their own way of experiences of their daily lives.

In this sense, it was concluded that it is quite important to conduct such studies with young students who are to take science education.

As a result of observations of the researcher who is also an educator and informal meetings with other teachers during this study, it was pointed out that teachers, too, have a hard time in teaching abstract concepts, therefore, proper class tools and materials need to be developed.

5. Recommendations

In this study, learning outcomes related to 3rd grade life sciences, which was put into practice starting from 2014-2015, were taken into account to discover misconceptions of students. It may be recommended that classroom teachers or subject-matter teachers pay attention to such misconceptions within scope of life sciences class.

Since life sciences class include numerous abstract concepts, such concepts may give rise to misconceptions in students. Discovery of such misconceptions at an early stage and adaptation of teaching to such concepts will help increase achievement of students. It was ascertained that, as a result of this study, students interpret events they frequently encounter in their daily lives in line with their personal experiences and knowledge acquired from others around them. Following recommendations may be proposed in the light of these thoughts.

- 1) First of all, this study and any other similar study should be used to establish preliminary knowledge of children who meet life science class at a very early age in the primary school. Thus, guidance may be offered to MoNE and teachers.
- 2) Interviews could be conducted with more students with similar studies to be conducted. Thus, an in-depth research of concepts could be made possible.
- 3) Cronbach Alfa reliability coefficient of KYBT developed as part of our study was found to be 0.67. As the data collection tool, the interview method was also used as a supporting element in addition to the test. However, researchers may be recommended to improve KYBT and implement the coefficient by further increasing the same.
- 4) Support by the Ministry of National Education for studies in this field could be recommended.
- 5) Classroom teachers as well as life sciences teachers should be informed about misconceptions discovered through studies of this kind through on-the-job trainings.
- 6) It may be recommended that class materials to be developed by MoNE be prepared in line with misconceptions derived from this study and other similar studies.
- 7) It may be recommended that teachers teaching life sciences teach the concepts through personal experiences and hands-on practice.
- 8) It may be recommended that activities to be conducted during life sciences class be conducted in a way that can be correlated with the daily life.
- 9) Since life sciences include abstract concepts to a great extent, it may be recommended that visuality be prioritized on the materials to be used for teaching, in the first phase of the primary education in particular.
- 10) Academicians may be recommended to conduct similar studies whereby misconceptions of this age group can be discovered.

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