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FLOWERS OR FLOWERING PLANTS?: DETERMINING ALTERNATIVE FRAMEWORKS AND SOURCES OF THESE IN ELEMENTARY SCHOOL

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ABSTRACT
This study aimed to determine the alternative frameworks of elementary school 6th grade students (aged 12-13) regarding the *flower* organ (alternative frameworks) and sources of these alternative frameworks. A total of 158 students from 3 public schools in the province of Bursa participated in the study. In this descriptive and qualitative study 3 open-ended questions were asked, a drawing was made and 7 plant illustrations were used. As a conclusion, it was observed from the students' answers to the questions, the drawings and comments on the illustration that the most prominent alternative frameworks were those of using the flower, the reproductive organ of the plant, in place of the flowering plant, classifying it as a separate plant class and defining its reproductive function as helping reproduction, especially through its color and odor. It was determined that these alternative frameworks resulted more frequently from daily experiences and visual perceptions in real life, incorrect structuring of scientific knowledge given in the teaching environment and from cultural language.
Keywords: Science education, daily life, alternative frameworks, visual perception, flower concept

INTRODUCTION

Concepts in science education occupy an important place in understanding the complex structure of the environment and the constitution of a formal cognitive texture through pieces of obtained scientific knowledge complementing each other. Students construct their knowledge based on observations which they make starting from an early age and before starting school they acquire scientifically invalid information about some concepts as a result of their experiences (Barman Stein, McNair and Barman 2006). The acceptance of differences from scientific facts, although apparently consistent in itself and organized in a way to meet daily needs, and cognitive structures created in a scientific framework affected by various factors in an invalid manner, are defined as alternative frameworks (Gilbert and Watts 1983; Driver 1989; Palmer 1999; Seligin 2012). It is stated that *daily experiences (inferences made from observations, phenomena), teaching environment (scientific knowledge, course book, teacher strategy)* and *cultural factors (language, belief)* have effects on students' constructing their alternative concepts (Gilbert and Watts 1983,; Driver 1989; Science Teaching Reconsidered: A Handbook 1997, 28, Palmer 1999). Alternative frameworks arising from different sources are items of knowledge with no comprehensive scientific knowledge base but which can maintain their functionality in life and, if not removed, are likely to continue through further reinforcement in the following years. For students' existing knowledge to reach a level accepted as scientific is possible primarily through finding the sources of alternative frameworks and removing them and overcoming these resistance thresholds (Palmer, 1999; Harlen, 2001). Hence, it is necessary to make a considerable effort to achieve the correction of this kind of alternative framework and make correct associations. Such dilemmas are likely to be encountered primarily in learning life, and in later years at every stage of the teaching process (Treagust 1988, Driver 1989; Hewson and Hewson 1983, Hellden 2004; Lin 2004,).

In this study, the concept of *flower* as included in the science teaching program and which is also prominent, and observed in daily life is emphasized. Scientifically, the concept of *flower* essentially denotes some plant organisms, their essential reproductive structures including carpel and stamen and the parts including auxiliary structures which contain sepals and petals (Abercrombie et al 1974;

Marth and Hine 2008). In a broader sense, it is also possible to state that it is the reproductive organ of a group of plant species. The use of the word 'flower' with different meanings and definitions in domestic and foreign books and its having come to the fore in science lessons as a biological concept (Akman, 2008; Graham et al 2008) and the presence of incomprehensibilities, missing statements and even mis-statements in dictionaries in Turkish (Güncel Tükçe Sözlük 2012) and foreign languages (Thatcher et al., 1969:55) have helped these alternative frameworks to become rooted worldwide and have maintained and virtually fed these biology-based alternative frameworks as information-sourced.

In Turkey students learn about the parts of a plant in detail when they are 6th graders (aged 12-13) and inferences they have made both from their daily lives and observations until this time appear as a resistance to learning this concept. In the objectives and outcomes of the Ministry of National Education Program, it is emphasized that 6th grade elementary school students are supposed to know that the flower is the reproductive organ of the plant, how reproduction takes place in flowering plants and how fruit grows out of the flower. In the National Education Standards (1996:156), it is stated that the 5-8 years age group students may have some alternative frameworks in relation to the flower as a reproductive organ of the plant. Some studies have indicated that students, trainee elementary and biology teachers have some non-scientific alternative frameworks about the lifecycle of flowering plants, seed and fruit formation or the concept of the flower (Jewell, 2002; Hellden, 2004; Lin 2004; Barman et al., 2006; Gatt, Tunnicliffe,., Borg and Lautier., 2007; Yakışan, Selvi and Yürük, 2007; Mutlu and Özel, 2008; Topsakal and Oversby, 2011, Yürük, Selvi and Yakışan 2011). However, in both elementary and university level studies, there were not encountered alternative frameworks about the concept of flower as as an organ of flowering plants or sources of alternative frameworks In this study, it was aimed to determine alternative frameworks related to the *flower* organ in elementary students and the sources of these alternative frameworks.

Methodology of the Research

A total of 158 (73 female, 83 male and 2 anonymous) students from four elementary schools in the district of Osmangazi, Bursa, participated in the study.

In this descriptive, qualitative study, the participating students were asked 3 open-ended questions, a drawing was made and 7 plant illustration were used..

The open-ended questions were based on the data obtained from interviews held with 10 students who were selected using criteria such as success level, interest in nature and willingness to participate in the study within the framework of the objectives and desired outcomes of the Elementary Science Education 6th Grade Program. According to students answers, questions were reorganized and the data was collected by questionnaires. Three questions were asked to determine students alternative frameworks. First question was asked to determine alternative frameworks which results from their cultural environment, second question was determined to analyze visual alternative framewors which structured as a result of their observations and the last one was asked to determine alternative frameworks which based on teaching environment. The answers given to the questions were evaluated correct and incorrect. correct answers evaluated based on correct, partly correct and wrong explanation. To determine alternative frameworks, correct answers with wrong explanations and incorrect answers with wrong explanations were analyzed . Irrelevant explanations were not analyzed.

The students were asked to draw a flower and indicate its parts with the aim of revealing the students' alternative frameworks based on their perceptions about the concept of flower so it was not given

species names in particular The words which the students chose to name the parts when drawing a flower were evaluated in two main groups, namely those accepted as scientifically correct and those which were scientifically incorrect.

After questionnaires and asked to draw a flower, Some illustrations of plants were shown the students one by one and then asked to choose which ones were flowers, if there were any flowers in these illustrations.The illustration of plants were chosen according to their leaves and flower by with an expert specialized in this field. (*Philodendron bipimatifidium* was chosen because of its patterned leaves, *Gynura aurentiaca, Cryptanius bivittatus and Ember lace were* chosen because of their coloured leaves, *Heleborus sternii* and *Avena sativa was chosen* because of their green petals and *Justicia brandegeana* was chosen because of its coloured petals.) The choosen illustrations were classified as correct or incorrect.

Since the findings obtained from the research questions and the student drawings and the answers given to the illustration were examined again with an expert specialized in this field then the percentage and frequency values of the collected qualitative data were calculated.

Results

The question 1 "*Do all plants have flowers*?" was answered by 158 students. 140 students gave the correct answer "Yes, there is" but only 42.9% of the students gave an explanation (Table 1). 42.9% of the students gave a correct explanation such as "*Some plants are flowering and others are non-flowering, there are also non-flowering plants (*30.8%), *Plants are classified into two, namely flowering and non-flowering (*5.5%), *Some do not have flowers, they reproduce through spores (*5.5%), *Non-flowering plants reproduce through spores. Flowering plants such as rose, tulip, non-flowering plants such as fern and algae (1.1 %) and* 23.1% of the students gave a partly correct explanation such as *For example, phyrophytes or/and fern do not have flowers (19.8%), Flower is the reproductive organ in plants. However, non-flowering plants can reproduce as well (2.2%)*, *For example, a daisy has flowers but a fern does not (1,1%).*

Table 1: Distrubituation of the Answers Collected by Questionnaires

Answers	Explanations	Question 1	Question 2	Question 3
Correct answer		88.6% (n=140)	80.2 % (n=77)	71.9 % (n=82)
	Correct explanation	42.9% (n=39)	7.5% (n=6)	39.9% (n=33)
	Partly correct explanation	23.1% (n=21)	25.0% (n=20)	42.0% (n=49)
	Wrong explanation	28.6% (n=26)	55.0% (n=45)	-
İncorrect answers		11.4% (n=18)	19.8 % (n=19)	28, 1% (n=32)
	Wrong explanation	5.5% (n=5)	12.5% (n=10)	28.1% (n=32)

The answers of the 31 students who had alternative conceptions are shown Table 2. It was observed that the answers with incorrect explanation were given in a quite scattered, unrelated way, and the students' knowledge was not sufficiently supported even via information obtained from daily life such as "*Forbs and grass are non-flowering plants ,Cactus is a non-flowering plant;; all plants first come into flower and then become plant*, *It helps all plants grow fruit or smell pleasant*".

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Table 2: Answers given to the question 1 "Do all plants have flowers? Please explain."

Answer	Explanation	Alternative frameworks	%
Correct	Wrong 28.6% (n=26)	*Forbs and grass are non-flowering plants*	6.6% (n=6)
		Plants have leaves or flowers	6.6% (n=6)
		Cactus is a non-flowering plant	5.5% (n=5)
		Flowers are divided into two	4.4% (n=4)
		It depends on if a male or female reproductive organ is present or not	3.3% (n=3)
		Trees are divided into two, namely flowering and non-flowering	2.2% (n=2)
Incorrect (Yes)	Wrong 5.5% (n=5)	*All plants first come into flower, then become plants*	2.2% (n=2)
		It helps all plants grow fruit or smell pleasant	1.1% (n=1)
		Flower is a plant	1.1% (n=1)
		All plants excluding cactus are flowering	1.1% (n=1)

The question 2 "*Is there a difference between a flower and a flowering plant?* was answered by 120 students but 96 answers were analyzed. 24 students did not give an answer. (Table1). 70 students gave the correct answer with an explanation but only 7.5% of the students gave a correct explanation such as *Flower is the reproductive organ of the plant; flowering plant is the one with flowers* (7.5%) and 25% of them gave a partly correct explanation such as *Flower is present in flowering plants /a part of them* (7.5%), *Flower is the plant's organ/part giving it beauty /odor. Flowering plant is the one with flowers* (6.2%), *The difference between them is that one is the flower and the other one is a flowering plant.* (6.2%), *Flower has an odor* (2.5%), *Flower is the reproductive part in the plant. A flowering plant has natural beauty* (1.2%), *It is a part of a flowering plant; its function is to attract insects to it* (1.2%).

62.5 % of the students wrong explanations are presented in Table 3. Explanations such as "*Flower itself is a plant, Flowering plant is a flower., Flowering plant is a flower, Since a flower is present in a flowering plant, it is not different, Flower is a plant which grows in nature by itself or we plant it.* indicate that they have alternative frameworks about the fact that a flower is a separate part of a plant and their explanations such as"*The difference between a flower and flowering plant comes from the color., Flower gives off odor, flowering plant produces fruit; Flowering plant is the plant with sepals and protecting flowers.*indicate that they have alternative frameworks about the reproductive function of a flower in a plant.

Table 3. Answers given to the question 2 "Is there a difference between a flower and flowering plant? Please explain."

Answer	Explanation	Alternative frameworks	%
Correct	Wrong 55.0% (n=45)	*Flower itself is a plant.*	10.0% (n=8)
		Flower gives off odor, flowering plant produces fruit.	7.5% (n=6)
		The difference between a flower and flowering plant comes from the color.	6.2% (n=5)
		Flowering plant has a flower on it.	5.0% (n=4)
		Unlike a flower, a flowering plant produces seed/fruit.	5.0% (n=4)
		Flower is the plant with different color and odor.	3.7% (n=3)
		Flowering plant is a flower.	3.7% (n=3)
		Daisy, violet, etc. is a flower.	2.5% (n=2)
		There is only flower, but there are many flowering plants.	2.5% (n=2)
		Flower is a landscaping plant.	1.2% (n=1)
		A flower stands alone with its leaves, but a flowering plant grows anywhere on a tree.	1.2% (n=1)
		Flower is a simple thing. Flowering plant is a plant.	1.2% (n=1)
		Flower itself is an organ. Flowering plant is present in a different plant.(1)	1.2% (n=1)
		Flower looks pleasant; flowering plant achieves pollination.	1.2% (n=1)

		The word flower brings to mind fragrance and color of petals but with the word, flowering plant, sepals surrounding petals come to mind. Flowering plant is the whole, but a flower is a part.	1.2% (n=1)
		A flower is the plant having only petals.	1.2% (n=1)
		Flower can exist both only by itself and as a part of a plant.	1.2% (n=1)
Incorrect (no difference)	Wrong 12.5% (n=10)	*Since a flower is present in a flowering plant, it is not different.*	5.0% (n=4)
		Flower means something which makes a plant look beautiful, gives a plant its color and gives off a pleasant odor.	5.0% (n=4)
		Flowering plant is the plant with sepals and protecting flowers.	1.2% (n=1)
		Flower is a plant which grows in nature by itself or we plant it.	1.2% (n=1)

The question 3 "*What is the function of the flower in a plant?* was answered by 116 students but 20 of them didn't analyzed. (Table 1). 42 students didn't give an answer. Correct answers were given by 39,9% of the students such as *It's the reproductive organ of the plant (*13.0%), *It achieves reproduction (*13.0%), *It achieves the plant's reproduction, pollination (*2.6%) and 42,9 % of the students gave a partly correct explanation such as *It gives the plant pleasant odor, beauty, color (*14.0%), *In addition to such functions as reproduction, pollination, fertilization, it has such functions as giving beauty and/or smelling pleasantly (*9.6%), *It is the reproductive organ and it has functions such as giving beauty and/or smelling pleasantly (*5.3%), *It yields fruits (*4.4%), *It achieves seed formation and dispersion (*3.5%), *It achieves formation of a new living being (*3.5%), *It achieves pollination (*1.8%), *It produces pollen (*0.9%). Students described its function from an aesthetic point of view as especially "*…smelling pleasant, giving beauty (29.8 %), giving color (15.2%)*" and did not comprehend completely.

The distribution of wrong explanation given to this question is shown in Table 4. Explanations such as "*It gives off oxygen air, and provides respiration, It hotosynthesizes, It yields food, It achieves sexual and asexual reproduction in a plant*" indicate that students had difficulty in relating to pieces of scientific information obtained from learning environment and had alternative frameworks resulting from this situation

Table 4. Answers given to the Question "What is the function of the flower in a plant? Please explain."

Answer	Explanation	Alternative frameworks	%
Correct	Wrong	-	-
Incorrect 28.1% (n=32)	Wrong	*It gives off oxygen, air, and provides respiration*	7.0% (n=8)
		It photosynthesizes	5.3% (n=6)
		It has growth and development	5.3% (n=6)
		It yields food	3.5% (n=4)
		It is responsible for dispersing mineral substance and water	1.8% (n=2)
		A flower achieves reproduction of a flower	0.9% (n=1)
		It is the reproductive organ of the plant	0.9% (n=1)
		It achieves the reproduction of the plant in petals, sepals	0.9% (n=1)
		It reproduces and comes into flower	0.9% (n=1)
		It achieves sexual and asexual reproduction in a plant	0.9% (n=1)
		It landscapes the environment	0.9% (n=1)

The students' drawing analysis is presented in Table 5. In the naming of the parts of the flower, it was found that male organ (50.3%) and female organ (42.1%) comprising the actual reproductive structure were used less frequently than sepals (59.7%) and petals (56.6%) which comprise the auxiliary structures. Moreover, the parts of female and male organs were described less frequently. It was also observed that when labelling the parts of the flower organ, the students used the names "*root*" (16.4%) and "*stem*" (25.7%) thus integrating it with the plant. When the students' drawings were examined, it was determined that they had some visual and iconic alternative frameworks about the concept of

flower. It was determined that 37.2% (n=53) of the total drawings also included leaves and/or roots. This indicates that the students had alternative frameworks in discriminating the flower as an organ of the plant visually and showing its parts correctly

Table 5. Distribution of The Names Used by The Students in The Drawings

		%		%
Naming accepted as scientifically correct	Sepal	59. 7% (n=95)	Calyx	12.6 % (n=20)
	Petal	56. 6% (n=90)	Ovary	10.1% (n=16)
	Male organ	50. 3% (n=80)	Style	5.7% (n=9)
	Female organ	42. 1% (n=67)	Anther	4.4% (n=7)
	Peduncle	15. 7% (n=25)	Stigma	4.4% (n=7)
Naming not accepted as scientifically correct	Peduncle	25. 7% (n=41)	Mound	5.7% (n=9)
	Leaf	22. 6% (n=36	Seed	1.9% (n=3)
	Flower	18.2% (n=29)	Ovule	1.9% (n=3)
	Root	16. 4% (n=26)	Flower root	0.6% (n=1)
	Pollen	11.9% (n=19)	Stigma organ	0.6% (n=1)
	Female reproductive organ	3.8% (n=6)	Male reproduction cell	0.6% (n=1)
	Male reproductive organ	3.8% (n=6)	Male reproduction	0.6% (n=1)
	Leaf stalk	2.5% (n=4)	Female reproduction cell	0,6% (n=1)
	Ovule	2.5% (n=4)	Female reproduction	0.6% (n=1)
	Female	1.9% (n=3)	Reproductive pollen	0.6% (n=1)
	Male	1.9% (n=3)		

The students were shown various illustration of flowering plants and plants with colored leaves and for each one were asked if they saw a *flower*. The answers are given in Table 6. It was observed that the students were mistaken mostly about the colored-leafed Cryptanthus *bivittatus* (65.3%) and *Gynura aurentiaca* (59.4%). Students had difficulty recognizing the leaf-like flowers of *Avena sativa and Justica brandegeana* and gave incorrect answers at the rates of 53.0% and 8.4% respectively. Incorrect answers were given at a rate of 12.9% related to *Helleborus sternii* with green-colored flowers. The students had difficulty distinguishing the *flower* organ from a plant, when there were different types of petals. Moreover, the incorrect answers given by the students to the plant illustration of *Cryptanthus bivittatus (63.5%) and Gynura aurentiaca (59.4%) and Philodendron bipimatifidum (37.4%)* indicate that the students may have perceived the *flower* in plants with different shapes or colored leaves, not as an organ of the plant but as the plant itself. So it was found that they had some visual and iconic alternative frameworks about the concept of flower when there were different types of petals or shapes or colored leaves.

Table 6. Distribution of The Answers Given by The Students to The Plant İllustration

Names of the plants	Correct %	Incorrect answer %
Helloborus sternii	88 % (n=87.1)	12.9 % (n= 13)
Ember lace	65.3 % (n=66)	34.7 % (n= 35)
Philodendron bipimatifidum	62.4 % (n=63)	37.6 %(n=38)
Avena sativa	47.0 % (n=47)	**53.0 % (n= 53)**
Justicia brandegeana	41.6 % (n=42)	**58.4 % (n= 59)**
Gynura aurentiaca	40.6 % (n=41)	**59.4 % (n= 60)**
Cryptanthus bivittatus	34.7 % (n=35)	**65.3 % (n= 66)**

DISCUSSION

In this study, it was determined that the students had alternative frameworks related to the concept of *flower* and these alternative frameworks had resulted mostly from real life experiences, incorrect structuring of scientific knowledge given in school and cultural language.

Answers given to the open-ended question "*Do all plants have flowers? Please explain*" such as *"forbs and grass are non-flowering plants, plants are leafed or flowering, forbs and grass are non-flowering plants, trees are divided into flowering and non-flowering"* provided information about the children's knowledge which they structured as a result of their observations. It was also observed that the children sometimes made classifications by stating that "*grass has no flowers"*, "*forbs and grass do not come into flower*", "*some plants are leafed or green, some are flowering ....*" and classified some plants whose flowers could not be observed as non-flowering plants. Barman et al. (2006) determined that students in K2, 3rd -8th grade students accepted the concept of *flower* as a plant and did not define *grass* as a plant since it did not have flowers. Chen and Ku (1999), in a study with aboriginal children, found that the students made a separate classification between flowers and grass. This finding indicates that the alternative frameworks of separately classifying the flower organ by integrating it with the plant in the classification of plants, which results from observation, is similar in different cultures. Hewson and Hewson (1983) stated that individuals may have preconceptions including different alternative frameworks as a result of their experiences, cultural and personal beliefs. They stated that when cultural differences exist, students from the same cultural group will have a wide range of alternative frameworks in their knowledge structures.

In the explanations given by the students to the question *"Is there a difference between the flower and the flowering plant?",* it was observed that the students used characteristics which they could observe in their daily lives such as *"The flower is the organ/part of the plant which gives it beauty/odor; The flower smells good; The flower emits odor; The flowering plant yields fruit; The flower is a plant with different color and odor; Daisies, violets, etc. are flowers; The flower is a landscaping plant"*. In a study by Yakışan, Selvi and Yürük (2007), it was determined that approximately half of the students (46.9%) defined flowers as structures with colored leaves and giving off odor. Jewell (2002) observed that the students remembered the flower from an aesthetic point of view more permanently than from its reproductive function. Tunnicliffe (2001) observed in a study of 7-, 9- and 11-year-old children that when observing plants the children paid attention mostly to characteristics of plants such as color, shape and odor. Although students are taught especially the typical outer structures of plants in the early years of school, when classifying plants it is known that they firstly compare them with plant images that they construct in their heads and then classify them according to their appearance and physiological characteristics **(**Chen and Ku, 1999; Barman et al., 2006). However, it can be stated that such pieces of information as *"my flowers are my non-speaking beautiful children; flowers beautify nature with their beautiful appearance and odors"* included in the course books in their earlier education years might have had effects on the formation or supporting of these alternative frameworks (Life Sciences 3rd Grade Course Book, 2011:67, Science and Technology 5th Grade WorkBook, 2011:98).

That the rate of those answering the question *"What is the function of a flower in a plant? Please explain"* as *"it is the reproductive organ"* remained at the rate of 30.7% indicates that the flower is responsible for reproduction in a plant had not been understood. That the rate of those giving incomplete, incorrect answers was 69.3% indicates that educators had significant difficulty in teaching the concept of *flower.* Although some of the answers given by the students were correct, it was

observed that they were integrated with incomplete or internally inconsistent information and hence a new structuring was formed. It was also understood that some of incorrect answers were *information-sourced*. In this context, statements used by the students such as "*Flowers photosynthesize*, *breathe, give off food, are in charge of growing and developing plants and distributing minerals and water"* indicate that scientific knowledge obtained from the teaching environment with the aim of supporting the answers was used incorrectly. Incorrect structuring of scientific information given in the teaching environment by students was defined as causing conceptual misunderstanding (Science Teaching Reconsidered: A Handbook 1997, 28). This indicates that students had alternative frameworks resulting from this situation. In a study of classroom teachers, Mutlu and Özel (2008) determined that the students had alternative frameworks such as "*flowering plants reproduce through seeds*" related to the understanding of flower and fruit formation stages of a flowering plant. Palmer (1999) stated that the whole of students' information results from their daily life experiences. For example, it was stated that a student explaining that butterflies are in charge of pollination cannot have this understanding just based on observation without having knowledge of pollination (Eberbach and Crowley, 2009). For example, children observing shrimps will firstly notice their salient features and behaviors and record their colors and shapes as features. However, since these features vary according to the gender of the shrimps, they cannot notice differences between them.

Another alternative framework again appearing in the answers given to this question is the insistence on combining the function of *flower* in the plant with *"appearance"* and "*odor"*. A similar alternative framework is seen in the explanations which they made to describe the difference between the flower and the flowering plant.

It was observed that some students had difficulty in drawing and others in naming. It can be stated that the students had visual alternative frameworks related to showing the flower as an organ of the plant. Besides using scientific knowledge in describing the structure of the flower such as *sepal, petal, female organ and male organ*, the use of items of knowledge comprising the structure of the flowering plant such as *flower, peduncle, leaf* and *root* in naming the drawings supports such an alternative framework. Moreover, that the number of students writing the parts of female and male organs in detail was quite low indicates that the students remembered surface characteristics more. Topsakal and Obeyby (2011) determined that trainee teachers could not name the parts comprising the male and female organs and named parts including alternative frameworks such as root, peduncle, seed, pollen, etc. They also observed that the trainee teachers added the root and peduncle structures when drawing the structure of a flower and this indicates that alternative frameworks continue to exist at later ages. In a study by Stein and McNair (2002) it was reported that participating 5th grade and high school biology students used petals, the colored and attractive part of the plant, in naming their drawings at a high rate related to the anatomic structure of the plant. In addition, in their labeling, there was very little difference between elementary school and high school students. It was determined that 35.7% of the 4th graders and 36.5% of the high school students labeled the *"pistil"* in their drawings and 29.2% of the 5th graders and 42.6% of the high school students labeled the *"stamen"* in their drawings. Observations and examinations made in daily life differ from scientific observations. Students regard phenomena (facts) as a result of such observations which are not associated with scientific reasoning and explanations, and not as the acquisition of new information. For this reason, real observations take place based on scientific knowledge, but in daily observations many unrelated features, and behaviors which fail to set up or develop relationships are noticed (Eberbach and Crowley, 2009; Tunnicliffe, 2001).

When the answers given by the students to the illustration were evaluated, it was determined that they evaluated the illustration including plants with colored leaves but with no flowers (*Cryphtantus*

bivittatus and *Gynura aurentica*) as flowering plants. For the illustration of *Avena sativa* and *Justica brandegeana*, whose petals do not have vivid colors and are visually different from flower illustration included in course books, they gave the incorrect answer at a high rate although they had the flower organ, but for the plant of *Helloborus sternii*, whose petals are very similar to those in coursebooks but with no bright and vivid colors, they gave incorrect answers at a very low rate. This indicates that students name plants with colored leaves as *flowers* and perceive them not as an organ of a plant but as a plant itself. Here it is observed that visual perception and scientific knowledge cannot be integrated. Eberbach and Crowley (2009) stated that while some people pay attention to concrete and vivid details (iconic type), others pay attention to images providing spatial relationships (spatial type). In this study, it can be inferred from the answers given by the students that the students are iconic type. Tunnicliffe (2001) determined that the students paid more attention to the plants with salient colored flowers, fruits or shaped leaves in their observations. In a study conducted with 2-, 4- and 6-year-old children, Chen and Ku (1999) gave the children flashcards and asked them to choose those including plants. It was determined that although some of these illustration included typical root, peduncle and leaf structures, others did not, and the children chose trees, roses, forbs and vegetables as plants at a high rate. However, when interviews were held about these illustration, it was observed that the students could not describe the parts of these plants correctly; for example, they described the reproductive organ of liverwort as flower or root. In school learning, especially when direct observations are not made, visual elements commonly take place in science education as an important part of education material and if visual objects are related to students' existing knowledge, conceptual perception and ability, they may make a meaningful contribution to the objectives of education and contribute positively to expected learning with difficulty (Braga et al., 2012; 127, 128). Tosakal and Overby (2011) stated that students' inability to perceive visual materials used in teaching biology-contented topics completely may be the source of alternative frameworks about these matters.

In general, what was also observed in the answers given by the students to the questions was that alternative frameworks resulting from using a concept in daily life with a meaning different from the one used in physical sciences may hinder the learning of scientific knowledge (Yağbasan and Gülçiçek, 2003; Ford, 2005). When Ford (2005) asked elementary students to describe rocks and minerals, he observed that the students used everyday language in place of scientific descriptions. For example, when describing rocks, the students used everyday language such as "looks like a cliff", "shaped like a lemon cliff". Everyday language hindered understanding of the characteristics of the rocks. As in many scientific activities, in the activity related to describing rocks and minerals, everyday language penetrated slowly through being used in the activity and as it was used, it became a part of it and this limited the conceptual development. In that study, the words like "shiny" and "sparkly" slowly replaced the scientific word "luster". Again, in a study with various age groups, Link-Perez et al. (2010) showed the students various plant illustration and asked them to name the illustration and determined that they used scientific names by adding such parts as flower, root and peduncle when naming plants (e.g., *Hibiscus* flower) and students named the illustration by adding plant parts such as leaf and flower like *oak leaf, hisbiscus flower* in place of the specific names of plants (orchid,…) as organs of the plants (root, peduncle, flower).

It has been observed that this alternative framework resulting from everyday cultural language continues to exist via course books and also has an effect in the teaching environment. The course books from the Kindergarden education program to the 6th grade Science and Technology Teachers guide book were investigated, it was observed that in Turkey the use the concept of flower in place of the flowering plant was culturally supported by course books and continued to exist Both in students' books and teachers' books, similar alternative frameworks were determined in which some statements use the concept of *flower* in place of flowering plant with such as "Together with children, plant

flower seeds in an appropriate place (Kindergarden Education Program (36-48-month-old)2006:157), Can you grow *flowers* in a dark room?(Life sciences 3th grade works book 2011: 142), We should not pick *flowers* (Science and technology 4th grade course book 2011:211) and For examination, *flowers* should be selected such as poppy, buttercup, geranium, rose, all the parts of which can be seen easily (Science and Technology 6th grade teacher's guide book 2011: 42).

As a conclusion, in the current study, it was observed from the students' answers given to the questions, drawings and illustration that alternative frameworks such as using the flower, the reproductive organ of the plant, in place of the flowering plant, classifying it as a separate plant class and defining its reproductive function as helping reproduction, especially through its color and odor, were more prominent. We can state that these alternative frameworks resulted from the inability to integrate scientific knowledge learned at school with direct or indirect observations and the inability to structure knowledge. Eberbach and Crowley (2009) stated that while real observations are made based on scientific knowledge, everyday observations are based on noticing many unrelated features and behaviors failing to set up relations and, as a result of their daily observations, this leads students to regard phenomena (facts) as phenomena which are not associated with scientific reasoning and explanations and do not provide new information. Again, in Turkey, the common use of the concept of *flower* in place of the flowering plant appears as an alternative framework resulting from cultural language and the use of the scientific concept different from scientific terminology hinders learning of the concept of flower. It also contributes to the continuity of the presence of alternative frameworks in course books including incorrect information in educational settings.

Traces can be seen of the damage caused by the alternative frameworks regarding the concept of flower through violating inter-conceptual integrity and affecting meaningful learning. This indicates that the connection between the teacher, the students and knowledge has not yet been overcome through meaningful and permanent learning can be seen. Studying this topic included in the first part of the teaching program in the second semester when spring comes and flower reproduction takes place will remove the alternative frameworks encountered in the teaching of this topic. Moreover, a classroom environment in which teachers bring various kinds of flowers and plants with colored leaves and support students' observations through scientific knowledge and select visual materials suitable for topics will help them comprehend topics correctly and thus make teaching more effective.

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Science and Technology 4th grade cours book, 2011

Science and Technology 5th grade teacher's quide book , 2011

Science and Technology 6th grade teacher's guide book, 2011