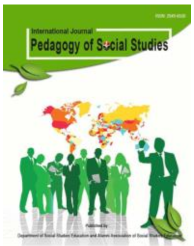

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The Effect of Scientific Events in Shopping Mall on Children's Learning and Social Interaction: Case of Life Cycle of Butterfly & Formation of Rainbow

Hakan TÜRKMEN

Department of Mathematics and Science Education, Faculty of Education,
Ege University & İzmir, Turkey.

Abstract— This study, it is aimed to determine the effect of scientific events in shopping malls on children's interactions and learning. Thirty-three children selected by purposive sampling method were carried out by participating in scientific events in a shopping mall, one of the informal learning environments of a big city. Data were collected through interviews before the scientific event session, observations and drawings during the scientific event session, and open-ended questions after the scientific event session. Content and frequency analysis were used in the analysis of the data. Before the events, the children participating in the study had deficiencies and misconceptions in scientific knowledge, but a significant increase was observed in their scientific knowledge at the end of the event. In the science event children learned by doing and experiencing (hands-on) and they had no difficulty in expressing their knowledge. In addition, it was observed that those who do not know each other got along very quickly with other children during the event. Helping and sharing with their friends who have difficulties in handicraft skills is the clue that they contribute to the development of their social skills. It also showed that children not only learn from a teacher but also learn from their peers. Expressing that they have fun and enjoy the science events can be shown as proof that children have a good time. After the scientific events, they emphasized that the children want to participate in such events again because this environment including different activities was found so colorful and not boring by children. If families bring their children to these types of scientific events in the shopping mall, that will contribute to children's school academic achievement and help them socialize. Based on the results of the study, it is suggested that the number of such science events should increase in shopping malls and the permanence of children's learning can also be searched.

Keywords— *Informal learning environment, hands-on activities, social interaction*

Correspondence. hakan.turkmen@ege.edu.tr
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A. INTRODUCTION

Learning is the process of adding new knowledge and new experiences to an individual's previous knowledge and old experiences. In this process, learning, which will be expressed by structuring knowledge by balancing the human mind, is divided into formal and informal learning. Formal learning is an effort to gain the desired knowledge and skills in the light of the planned and programmed goals for the individual in a certain period. Informal learning is the learning that occurs as a result of what they share with the individual's environment at every moment of life. The purpose of learning is to support the individual's self-improvement in life (Laçin-Şimşek, 2011). From that perspective, while schools, and related parts of schools such as sports areas, labs, are a formal learning environment, the family meetings, malls, sports activities, libraries, bazaars, zoos, museums, botanic gardens, aqua parks, science centers, planetariums, etc. are considered informal learning environments (Ertaş, Şen & Parmaksızoğlu, 2011; Köseoğlu & Türkmen, 2020; Türkmen, 2010).

From birth to death, individuals are involved in learning. Why we as teachers don't use informal environments for our science curriculum. Indeed, informal environments increase the lifelong learning of individuals as well as the social interactions with other people. Moreover, most of the scientific knowledge' root comes from nature, for example, water-lifting, gravity, magnetism, soil types, animals, plants, etc. why we have to teach this type of scientific knowledge in the classroom. In literature, many research says kids in the out of class can learn easily, have fun, improve their social skills. In Diamond (1986), Ash (2003), Briseno-Garzon, Anderson & Anderson (2007), Riedinger (2012), Callanan, Castañeda, Luce & Martin (2017), Ernst (2019), Kelly, Ocular & Austin (2020) studied kids with family groups at the informal learning environments, family groups affect each other and these interactions increase their learning. Collaborative activities in museums contribute to the development of skills by increasing social interactions.

Eberbach and Crowley (2005) investigated how real objects (live plants) and represented objects (virtual and model plants) affect visitors' descriptions of information of plants in the botanic garden. The diversity of objects differs in visitors' descriptions. The model and virtual plants have revealed long-term explanations. While supporting the daily experiences of live plants, model plants supported the school experiences. In this study, it was emphasized that informal environments will be connected with the school. Therefore, the way individuals can benefit themselves and their country, the importance given to formal education should be given to informal education. Piscitelli and Anderson (2002) investigated the experience of 77 children aged 4-6 years in museums in two different primary schools in Australia. They found that informal learning environments help students learn subjects more fun and more permanently. The learning outcomes in these environments are more valuable than traditional education and go beyond traditional learning. In these learning outcomes, there is also learning in aesthetic, social, and affective areas.

Learning is not just facts and concepts, especially when people start learning by motivating themselves, they go through a rich, emotionally charged mind filter. New learning is always the basis of prior knowledge. So, it can be said, learning is the product of the combination of prior knowledge, motivation, emotional, physical, and mental action. It must be an appropriate context for the formation of this product (Falk & Dierking, 2000). İf the prior knowledge has a dilemma, it is the biggest obstacle to learning for people (Eberbach & Crowley, 2005).

Teaching science in the informal learning environment is a hard and long way but we could not forget our goal, which is to teach scientific knowledge; to get them on an educational track and career path; to introduce them to the latest technologies, or new applications of science to industry. In that way, science teaching in an informal learning environment should be fun for students. The informal learning environment gives children the freedom to support their interests and questions. This comes from their desire to know because they feel like a scientist and behave like a scientist. Therefore, their job is a serious issue and they need concentration to finish their hard work. After all process, they had a good time. Moreover, we as teachers have to make it easy for every child to participate ithe n informal learning environment, whatever their level of formal educational preparation, their particular talents, and skills, their abilities, and disabilities. As much as possible, we should put children in charge of their learning in the informal learning environment, encourthem age to ask questions, and give them the tools and support to pursue their questions (Ekinci, Oktay & Şen, 2020; Eshach, 2007; Evren-Yapıcıoğlu, Arıkan, & Akbulut, 2021; Orion & Hofstein, 1994).

Thus learning is an active process rather than telling the scientific knowledge, we should give children the opportunity to feel it and understand it from direct experience. It is also important to have children should reflect on their experience and talk about what they felt, observed, and thought they learned. This process of investigation itself is open-ended, involving following leads and clues along a path of discovery and accumulation of evidence, and does not have a strict schedule to obey for students. We, as teachers, should give children lots of different ways to experience and understand a physical or natural phenomenon, when they are ready to organize it and they will express themselves (Griffin, 1994; Laçin-Şimşek, 2011, Türkmen, 2010).

Informal learning environments not only support children's learning in cognitive level (Bakioğlu et al., 2018; Bozdoğan & Yalçın, 2006; Ertaş, Şen & Parmasızoğlu, 2011; Paris, Yambor & Packard, 1998; Randler et al., 2007; Şahin & Sağlamer Yazgan, 2013; Türkmen, Doğru & Özen-Göktaş, 2018) but also increase their motivations and attitudes (Bonnette, Crowly & Shunn, 2019; Falk & Gillespie, 2009; Güler, 2011; Harvey et al., 2020; Kisiel, 2005; Martin, et al., 2016; Rennie & Williams, 2002; Yigit, Sivrikaya & Guven, 2021), and improve their social and psycho-motor skills (Shepard & Speelman, 1986; Tatar & Bağrıyanık, 2012).

Although the learning environment is important in learning the subject to be learned, it is also important that the scientific subject is compatible with the cognitive development of the learner. For this reason, many child development experts say that the subjects to be taught in schools should be appropriate for the development stage of children. The question of whether a subject above the child's development stage cannot be taught at all may come to our minds. Of course, it can be taught. When the learner encounters a new situation, there are 4 different possibilities for her/him to construct the experience gained in that process in her/his mind. If this new experience is compatible with the student's previous experiences, that is, with his/her cognitive structure, it is directly assimilated and new knowledge is structured. If this experience is not compatible with the current cognitive structure, a conflict (disequilibrium) situation occurs. In this conflict situation, knowledge cannot be constructed if the student resists learning. If this student accepts the contradiction situation without questioning, learning by rote is realized.

However, if the necessary arrangements are made by the teachers in this process, that is, if the balancing (equilibrium) is realized, meaningful learning takes place in the students. These events should be compatible with the developmental stages of the learner. The transition from one developmental stage to the next does not always occur between the same ages, because genetic epistemological factors, the organism as the source of development, can accelerate or slow down the transition between these stages. These factors are behavioral factors (in equilibrium), biological factors (growth), social factors, and cultural factors (experiences). If the more the student falls into a conflict situation (in equilibrium) his/her life and then get balance (equilibrium), how many different cross-cultural activities he/she is involved in, and how much he/she pays attention to his/her biological development and fulfills his/her physiological needs, the faster the transition between these development stages.

So, the more the informal learning environment has genetic epistemological factors influencing this transition, the more likely an individual is to learn information that is above the individual's developmental stage. In this study, there are two scientific events, the life cycle of butterflies and the formation of the rainbow, analyze in the shopping mall. While the life cycle of the butterfly is taught in the 7th grade unit of growth and development in living things, the interaction of light with matter and the refraction of light in another unit, the Physical matter unit, are mentioned about the formation of the rainbow.

The purpose of the study answers to research question which is "Does the scientific activities (even above of developmental stage of kids) in the Mall that are an integral part of our social life contribute to this process, which is children's cognitive, learning, and social skills are thought to improve? Due to the lack of studies in the field of learning in the informal learning environment, this study was decided to be done.

B. METHOD

Research Design

A case study, one of the qualitative research methods, was used in the study. In the case study, the researcher focuses on one unit, a real-life situation, then explores deeply to analyze it, because the reality has to be interpreted by the researcher. This interpretation allows highlighting the understanding of events and personal interactions. In this research, data were collected from structured interviews, observation techniques, and children's drawings.

Study Group

Children (max 12 years old) participating in weekend scientific activities in a shopping mall in a big city are the population of the study. Thirty-three children out of 48 children participated in the study. These children were selected by purposive sampling which is one of the non-probability sampling methods. The purpose is Purposeful sampling methods provides a detailed investigation of various situations in line with the purpose of the study (Büyüköztürk vd., 2016). Our reason for the selection of the purposeful sample was that the participants had to be under the age of 13 since the science topics in the scientific events were in the 7th-grade science curriculum. They should not have known this scientific knowledge before.

In the study, 2 science events in which the 6-11 age group can participate were used. Two scientific activities, "Life Cycle of the Butterfly" with the participation of 19 children, and "Formation of the Rainbow" with the participation of 14 children, were carried out at the weekend. Different children participated in both activities. The average age of children is almost 8 years old. The frequency distribution according to the ages of the children participating in the event is also shown in table 1.

Table-1. Frequency distribution by age

Age	**6**	**7**	**8**	**9**	**10**	**11**
Frequency	5	8	10	5	3	2
%	15,2	23,5	29,5	14,7	8,8	5,9

Data Collection Tools

Before the scientific activities started, two questions, (1) "May I know your age? (2) What do you know about butterflies? / What do you know about the rainbow?", was asked to the children. The observation checklist prepared by the researcher was marked in order to record the situations experienced by the children during the scientific activities. After ending scientific activities, one question, "Can you draw the life cycle of the Butterfly to the children at the end of the event? / Can you draw the formation of the rainbow?" asked participants. The drawings were analyzed in 4 themes as "phases of formation", "sequence of phases", "links" and "scientific term contents". For inter-rater reliability, 3 experts were asked to evaluate the data extracted from the children's drawings.

Drawing analyzes were found to be consistent at a rate of 81%. Moreover, the children were interviewed by asking 6 open-ended questions, four questions are related to scientific events, one is related to learning at school, and the last question is related to scientific information. The interview questions are (1) "How did you feel during the scientific event? (2) What caught your attention the most at the end of the scientific event? (3) What do you think about the learning environment? (4) If activities continue in the future, would you consider participating in such scientific events? (5) Can you relate the event held here with the information you learned at school? (6) What did you learn about butterflies? / What did you learn about rainbow formation?

Data Collection Process

The physical conditions, especially lighting and heat setting, of the event area were examined before the activities started in the shopping mall. In the event environment, colored rectangular tables were arranged in a U shape and colorful rainbow, ladybug and flower pictures hung up in order to attract children's attention. Even, while choosing the event area, it was paid attention to be in the wide area and to be visible from the stores and food court.

Participants were interviewed half an hour before the scientific event on Saturday and Sunday, after getting permission from parents. Since the families did not allow audio recording during the interview, the children's answers were carefully noted by the researcher. The scientific activities were carried out sequentially as the life cycle of the butterfly and the formation of the rainbow, 4 times a day, with an interval of 1 hour. Each scientific event was conducted by two guides, one researcher, and a maximum of 6 participants.

In the life cycle of the butterfly event, the video related to the butterfly was shown to the children. Afterward, colored cardboards, cotton, glue, crayons, scissors, and molds were given by the guides in order to create the stages of the butterfly's life (modeling) in the light of using their skills and observations. Next, the created models were hung on the board. After that, the teaching process was carried out by models on a board and discussing the theoretical information on them. Finally, they drew their own butterfly and wrote what they learned in drawings.

In the formation of the rainbow event, the guides started the event with an experiment. They used glasses, water, paper, and mirrors in the experiment. The instruction of the experiment starts with (1) Filling the glass with water, (2) putting the mirror into the water inside the glass at an angle, (3) Positioning the glass so that sunlight shines directly at the mirror. You may have to shift the mirror to find the right angle, (4) Look for a reflection on the paper on the table. Adjust the angle of the mirror until you see a rainbow on the paper. Afterward, colored cardboards, cotton, glue, crayons, scissors, and, molds were given by the guides. Next, each child made a rainbow model in the light of using their skills and observations, and the models were hung on the board, like the life cycle of the butterfly event. After that, the teaching process was carried out by models on a board and discussing the theoretical information on them. Finally, they drew their own butterfly and wrote what they learned in drawings. In both scientific events, guides and other friends helped the struggling children. In both scientific events, the children, who struggled to make models and draw pictures, were helped by their friends and guides.

In the research, children were observed, what their movements of each child, how their conversations with their families, and their interactions with other children, during both activities. At the end of both scientific activities, semi-structured interviews were made with the children who were interviewed at the beginning, and then their drawings related to the scientific content were collected.

Table 2. Scientific Event Process

Saturday / Sunday	**12:50-13:00 Before Scientific Event**	**13:00-13:45 Life Cycle of Butterfly Event**	**13;45 After Scientific Event**	**13:50-14:00 Before Scientific Event**	**14:00-14:45 Formation of Rainbow Event**	**14:45 After Scientific Event**
	1 question	* Video * Modeling * Scientific content * Drawing	6 Interview questions	1 question	* Experiment * Modeling * Scientific content * Drawing	6 Interview questions
	14:50-15:00 Before Scientific Event	**15:00-15:45 Life Cycle of Butterfly Event**	**15:45 After Scientific Event**	**15:50-16:00 Before Scientific Event**	**16:00-16:45 Formation of Rainbow Event**	**16:45 After Scientific Event**
	Same above	Same above	Same above	Same above	Same above	Same above

Analyzing Data

Frequency and content analysis was carried out for the data obtained from the interviews, observations, and drawings.

C. RESULTS

The first question asked to determine the level of children's knowledge before the activities, was what do you know about butterfly/rainbow? All the children participating in the study said something more or less, but unfortunately, no child could give a clear correct answer about either the butterfly or the rainbow. All nineteen kids said butterflies are colorful livings. Additionally, 5 kids' answers were related to the anatomic structure of butterflies, and only 2 kids' responses were related to the life cycle stages of butterflies. All children joining the rainbow event think rainbows appear after rain. Moreover, 7 kids' answers were related to the colors of the rainbow, and only 2 kids' answers were correct in the order of color of the rainbow, 2 kids' answers were related to about formation of the rainbow (Tablo 3).

Table 3. Children's Pre-Scientific Knowledge

Question	Code	Frequency	%
What do you know about butterflies?	Colorful	19	73,1
	Anatomic Structure	5	19,2
	Life cycle stages	2	7,7
What do you know about rainbows?	Appear after rain	14	56
	Number of Colors	7	28
	Order of colors	2	8
	Formation	2	8

Some examples of all children participating in the life cycle of butterfly event expressing that butterflies are colorful;

K6; *Creatures with wings like colorful flowers*

K11; *I saw many white, yellow, brown, pointed color butterflies.*

Five children gave information about the content of the "Anatomical structure" of butterflies, for example;

K6; *Butterflies have wings and tails, they fly like birds but not as big as birds,*

K12*; …their wings are like birds, but the difference is butterfly has antennae*

Two children gave incomplete information about the life cycle stages of butterflies, for example;

K8; *A caterpillar turns into a butterfly and its life is 1 day,*

K2; *The caterpillar becomes a butterfly. The first caterpillar is making a pupa. Then he eats the pupa. Then a colorful butterfly is formed.*

All children joining the rainbow event think rainbows appear after rain. Moreover, 7 kids' answers were correct about how many colors the rainbow has. Examples of their thoughts;

K10: *There are 7 colors in the rainbow*

K14: *The colors in the rainbow are yellow, purple, orange, green, red, blue, and dark blue*

Only 2 children were able to tell the correct order of the number of colors in the rainbow, for example;

K10: *The colors in the rainbow are red, orange, yellow, green, blue, navy and purple*

Only 2 children were able to give correct information about how the rainbow was formed. Examples of their thoughts;

K10: *The sunlight hits the drops after rain. Then the light is refracted, reflected, and refracted in the air.*

Observation made during the activities, children's interactions with each other and being disturbed, and intervention by their families were marked on the checklist. It was observed that 10 children (52.6%), in the Life Cycle of the Butterfly event, and 7 children (50%), in the Formation of Rainbow event, helped each other. The rate of sharing the tools and equipment given by the guides in the event area is 52.6% in the Life Cycle of the Butterfly event, while it is 50% in the Formation of Rainbow event. It was observed that 5 children (26.3%), in the Life Cycle of the Butterfly event and 4 children (28.6%) in the Formation of Rainbow event, got up from their chairs and move around to ask questions to the guidance teacher, show their families what they had done, and help their friends.

During the model-making process, 4 kids (21.1%), in the Life Cycle of the Butterfly event, 3 kids (21.4%), in the Formation of Rainbow event, had difficulties, which are not being able to remove the molds, not being able to open the glue, not being able to cut with scissors, and being unable to nice draw. One of the reasons for the difficulties of the children was the external interventions by their families. Three kids' parents (15.8%), in the Life Cycle of the Butterfly event and 5 kids' parents (35.7%), in the Formation of Rainbow event, interfered with the children and caused them to be adversely affected. One mother was angry with the child who slid the tablecloth, and the kid cried. Two children (10.5% and 14.2% each) who participated in both scientific events expressed that they were bored and asked the guides when it would be over. Although a few children had negative experiences, the 17 kids (89.5%), in the Life Cycle of the Butterfly event, 12 kids (85.6%), in the Formation of Rainbow event, showed positive attitudes with facial expression (like laughing, smiling, and telling their excitement to their parents, etc) (Table 4).

Table 4. Observation data

Code	**Life Cycle of Butterfly Event (19 kids)**		**Formation of Rainbow Event (14 kids)**	
	Frequency	**%**	**Frequency**	**%**
Help each other	10	52.6	7	50
Sharing	10	52,6	7	50
Move-ment	5	26,3	4	28,6
Struggle	4	21,1	3	21,4
Parents Intervention	3	15,8	5	35,7
Boring	2	10,5	2	14,2
Positive attitudes	17	89,5	12	85,6

At the last level of the scientific events, the children were asked to "draw about what they learned". In the Life Cycle of Butterfly event, drawings showed that while all of the children, except 1kid, drew the egg-caterpillar-pupa-butterfly phases correctly, 2 children made a sequencing error. In the code of "Links" part, only 4 children could not establish a link between the two phases in their drawing. In the code of "Content" part, 5 children could not write the names of the phases in their drawings.

In the Formation of Rainbow event, 2 children made mistakes in drawing the rainbow formation phases, 4 children made mistakes in ordering the phases of the rainbow and showing the connections of the phases, and 3 children made mistakes in writing the scientific content information (Table 5).

Table 5. Children drawings

Code	**Life Cycle of Butterfly Event (19 kids)**		**Formation of Rainbow Event (14 kids)**	
	frequency	**%**	**frequency**	**%**
Phases	18	94,7	12	85,7
Order of phases	17	89,5	10	71,4
Links	15	78,9	10	71,4
Scientific Content	14	73,7	11	78,6

Sample of drawings;

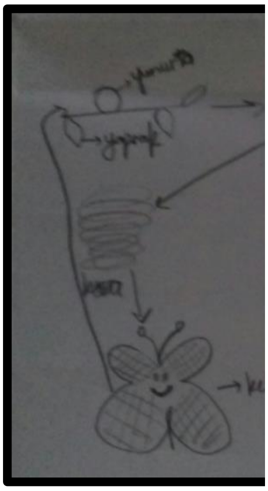

Figure 1. Correct Drawing of Life Cycle of Butterfly

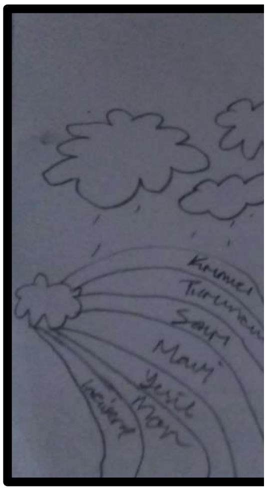

Figure 2. Correct Drawing of Formation of Rainbow

After the scientific activities were over, the children were interviewed again. While all 33 children were interviewed before the scientific events, the parents of the three children refused the researcher's request to interview their children due to unknown reasons.

The interview started by asking how you feel about scientific events. It was determined that there was more than one change in their feelings during the event. Since the children did not know clearly what to do at the beginning of the scientific event, 8 children (26.7%) felt "fear", 4 children (13.3%) felt "anger", especially because of the noisy environment and the behavior of their parents. In addition, 20 children (66.7%) stated that they were not bored and oppositely they enjoyed it a lot. That is, it was "fun". Twelve children (40%) said that they were waiting with curiosity and excitement for each next step in the scientific event process. While two children (6.6%) felt "bored", another 2 children (6.6%) stated that they did not know what they were feeling (Table 6).

Table 6. Feelings of Scientific activities? (For both activities)

	Fun	Excitement	Fear	Angry	Boring	Don't know
Frequency	*20*	*12*	*8*	*4*	*2*	*2*
%	*66.7*	*40*	*26.7*	*13.3*	*6.6*	*6.6*

In the second question "What caught your attention the most", the children said that there was more than one situation that caught their attention. The highest answer was "colorful activities" (66.7%). The frequency of children who see the scientific process as "having a good time" (26.7%) is at a level that cannot be underestimated. There are 5 children (16.7%) who do not hesitate to give their tools to others or who see other friends "share" tools and patterns. On the other hand, 3 children (10%) describe a negative situation by mentioning "noise-confusion" (table 7).

Table 7. At the end of the event, what did you pay attention to the most?

Code	**Colorful Activities**	**Have a great time**	**Sharing**	**New knowledge**	**Noise-Confusion**
Frequency	*20*	*8*	*5*	*4*	*3*
%	66.7	26.7	16.7	*13.3*	*10*

In the third question, the children expressed many thoughts about the event's environment. While the majority of the children were satisfied with the environment (80%), some of them were described as "little noisy" (20%), due to the music in the shopping mall, the voices of the people passing by, and the interventions of their families. While two of the 3 children (%10) were uncomfortable with the foot of the table and sitting position, 1 child stated that the chair she was sitting in was small (table 8).

Table 8. What do you think about the event environment?

Codes	**Great**	**Little noisy**	**Sitting problem (Position of the table)**
Frequency	24	6	3
%	80	20	10

The 4th and 5th questions asked to the participants aim to compare the scientific event process with the learning process in school. In the fourth question, "Will you participate in such activities in the future", 29 of the 33 children showed their excitement and interest by answering yes. For example;

K12: *I hate to come to the shopping mall but after these types of scientific events I am looking forward to coming every week.*

In the fifth question, *Is there any connection between the scientific event held here and the school?"*, 10 children (30.3%) were able to connect *between the learning in the shopping mall and the school?"* while 23 children (69.7%) criticize the teaching process at school. They said they understand scientific knowledge better and learning is more fun in the shopping mall. For example;

Örneğin

K12: *Our lessons at school are not that much fun*

K21: *While my hands ached from writing at school, and never do funny experiments.*

Table 9. Scientific Event and School Connection

Questions		Frequency	%
4. Will you participate in such events in the future?	Yes	29	87,9
	No	4	12,1
5. Is there any connection between the scientific event held here and the school?	Yes	10	30.3
	No	23	69.7

In the last question of the interview, "What did you learn about Butterflies/Rainbows", the level of children's understanding of scientific knowledge was investigated. The interesting thing is that all the children say something about the subject. It is pleasing that there are no children who can't answer. 16 children (84.2%) gave the correct order of stages of the life cycle of a butterfly. The number of children who knew the color order of the rainbow accurately was 10 (71.4%), and the number of children who clearly explained the rainbow formation process was 12 (85.7%). For example;

K12: *Butterflies lay eggs. Over time, the egg turns into a caterpillar and turns a pupa. A beautiful new butterfly emerges inside the pupa.*

K9*: Rainbows are formed when light from the sun is refracted by water droplets, dispersion, and reflection, and finally, refraction occurs again when the light goes out from water droplets.*

Table 10. What Children Learn

Codes		Frequency	%
What did you learn about butterflies?	The correct order of stages of the life cycle of a butterfly	16	84,2
	Wrong order of stages of the life cycle of a butterfly	3	15,8
What did you learn about rainbows?	The correct order of the colors of the rainbow	10	71,4
	Wrong order of the colors of the rainbow	4	28,6
	The correct order of the formation of rainbow	12	85,7
	Wrong order of the formation of rainbow	2	14,3

D. CONCLUSION

Science is life itself. It is one of the most important outputs of the 21st century to be given formal education as well as enriched with informal learning environments. In many studies conducted in the literature, the science lessons applied in informal learning environments support students both cognitively and affectively (Leibham, Alexander & Johnson, 2013; Piscitelli & Anderson, 2001; Şahin & Sağlamer Yazgan, 2013; Türkmen, Doğru & Özen-Göktaş, 2018; Yigit, Sivrikaya & Guven, 2021). Shopping malls, which have become an integral part of our social life, can be used as an active learning environment as well as implicit learning. In this study, it has been tried to emphasize the learning and interactions of the children who encounter the first time at unique scientific events in a shopping mall.

The inclusion of children in the study was coincidental. Children saw the science event stand, contacted the authorities, and be informed about the study, and then joined the study with their family's permission while they were visiting the mall with their families. It has been observed that many people who see the children doing in the interactive science event areas stopped and were interested with their sense of curiosity. Curiosity and interest are the main stimuli for learning (Diamond,1986; Falk & Adelman, 2003; Jones, Taylor & Forrester, 2011).

When the scientific knowledge of the children was questioned before the science activity session, it was observed that they had deficiencies or no knowledge. At the end of the science event session, the pictures they drew and the interview made by the researcher showed that their knowledge increased from a low level to a very high level. These results improve that children can learn any information above their development stage if a good learning environment is designed and a teaching model is applied. Such environments increase the speed of children's transition between developmental periods and help them gain abstract thinking skills more quickly. And so, the transitional age to the formal developmental stage decreases.

Since the science event allows children to learn by doing and experiencing (hands-on), they had no difficulty in expressing their knowledge. In addition, it was observed that they got along very quickly with other children during the activity. Helping and sharing with their friends who have difficulties in handicraft skills is the clue that they contribute to the development of their social skills. It also showed that children not only learn from a teacher but also learn from their peers, and reminded us as educators that teachers should teach their lessons in the form of collaborative learning activities. Moreover, the interactions that occurred during the science events sessions increased each other's motivation. Expressing that they have fun and enjoy the science events can be shown as proof that children have a good time.

In the interviews held with the children after the science event, they emphasized that the children want to participate in such activities again. The learning environment including different activities for only one science knowledge was found colorful and not boring by children. If these kinds of science activities increase in shopping malls, it is a good opportunity that instead of spending time in front of the computer at the weekend, bringing children to scientific activities in the shopping center will both contribute to school academic achievement and help them socialize.

In addition, it was observed that the children did not leave any part of the scientific event sessions because they participated in the activities in the shopping center voluntarily. This supported the volunteering feature required for meaningful learning in informal learning environments (Türkmen, 2010). Thus all the above results of the study showed shopping malls can be used as a learning environment. This study also showed that children's voluntary participation in similar activities at schools should be ensured or their motivation should be increased and collaborative learning approach never be forgotten by teachers.

REFERENCES

Ash, D. (2003). Dialogic inquiry in life science conversations of family groups in a museum. *Journal of Research in Science Teaching, 40*(2), 138–162. DOI:10.1002/tea.10069

Bakioğlu, B., Karamustafaoğlu, O., Karamustafaoğlu, S. & Yapıcı, S. (2018). The effects of out-of-school learning settings science activities on 5th graders' academic achievement. *European Journal of Educational Research, 7*(3), 451-464.

Bonnette, R.N., Crowly, K. & Shunn, C.D. (2019). Falling in love and staying in love with science: ongoing informal science experiences support fascination for all children. *International Journal of*

Science Education. *41*(12), 1626-1643. DOI:10.1080/09500693.2019.1623431

Bozdoğan, A. E. & Yalçın, N. (2006). The Effects Of Science Centers On The Change Of "Science Interest" Levels Of Primary Education Students And On Their Academic Success: Energy Park. *Ege Education Journal*, *2*(7), 95-114.

Briseno-Garzon, A. Anderson, D. & Anderson, A. (2007). Adult learning experiences from an aquarium visit: the role of social interactions in family groups. *Curator: The Museum Journal*, *50*(3), 299-318.

Büyüköztürk, Ş., Çakmak-Kılıç, E., Akgün, Ö. E., Karadeniz, Ş. & Demirel F. (2016). *Scientific research methods* (20. Ed). Pegem Publishing, Ankara.

Callanan, M. A., Castañeda, C. L., Luce, M. R., & Martin, J. L. (2017). Family science talks in museums: Predicting children's engagement from variations in talk and activity. *Child Development*, *88*(5), 1492–1504. DOI:10.1111/ cdev.12886

Diamond, J. (1986). The Behavior of Family Science Museums. *Curator*, 29(2), 139-154.

Eberbach, C. & Crowley, K. (2005). From Living to Virtual: Learning from Museum Objects. *Curator*, *48*(3), 317-338.

Ekinci, S., Oktay, Ö., & Şen, A. İ. (2020). A mobile planetarium activity: investigation of middle school teachers' views. *Gazi University Journal of Gazi Educational Faculty*, *40*(3), 827–852.

Ernst, J. (2019). Zoos' and aquariums' impact and influence on connecting families to nature: An evaluation of the nature play begins at your zoo & aquarium program. *Visitor Studies*, *21*(2), 232–259. DOI:10.1080/ 10645578.2018.1554094

Ertaş, H., Şen, A. İ. & Parmasızoğlu, A. (2011). The Effects of Out-of School Scientific Activities on 9th Grade Students' Relating the Unit of Energy to Daily Life. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education* , *5*(2), 178-198.

Eshach, H. (2007). Bridging in-school and out-of-school learning: formal, non-formal, and informal education. *Journal of Science Education and Technology*, *16(2)*, 171–190.

Evren-Yapıcıoğlu, A., Arıkan, K., & Akbulut, A. (2021). An evaluation of one day science activities at a natural history museum. *Journal of Theoretical Educational Science*, *14*(4), 524-547.

Falk, J. H. & Adelman, L. M. (2003). Investigating the impact of prior knowledge and interest on aquarium visitor learning. *Journal of Research in Science Teaching*, *40*(2), 163- 176.

Falk, J. H. & Dierking, L. D. (2000). *Learning from museums: Visitor experiences and the making of meaning*. Walnut Creek: Alta Mira Press. http://isites.harvard.edu/fs/docs/icb.topic1025195.file.

Falk, J. H. & Gillespie, K. L. (2009). Investigating the role of emotion in science center visitor learning. *Visitor Studies*, *12*(2), 112–132.

Griffin, J. (1994). Learning to learn in informal science settings. *Research in Science Education*, *24*, 121-128.

Güler, A. (2011). The effect of a planned museum visit on the attitude of primary school students. *İlköğretim Online*, 10(1), 169-179.

Harvey, D. J., Montgomery, L. N., Harvey, H., Hall, F., Gange, A. C., & Watling, D. (2020). Psychological benefits of a biodiversity-focussed outdoor learning program for primary school children. *Journal of Environmental Psychology*, *67*, 101381.

Jones, G., Taylor, A., & Forrester, J. H. (2011). Developing a scientist: A retrospective look. *International Journal of Science Education*, *33*(12), 1653–1673. DOI:10.1080/09500693.2010.523484

Kelly, K.R., Ocular, G. & Austin, A. (2020) Adult-child science language during informal science learning at an aquarium, *The Social Science Journal*, DOI: 10.1080/03623319.2020.1727226

Kisiel, J. F. (2005). Understanding elementary teacher motivations for science fieldtrips. *Science Education*, *89*(6), 936–955.

Köseoğlu, P. & Türkmen, H. (2020). Perspectives of science teachers about science teaching in informal setting. *Journal of Research in Informal Environments*, *5*(1), 44-58

Laçin-Şimşek, C. (2011). *Fen öğretiminde okul dışı öğrenme ortamları* (Out-of-school learning environments in science teaching) (1. Ed.). Pegem Publishing, Ankara.

http://www.pegem.net/dosyalar/dokuman/3072015091935.

Leibham, M.B., Alexander, J.M., & Johnson, K.E. (2013). Science interests in preschool boys and girls: Relations to later self-concept and science achievement. *Science Education*, *97*(4), 574–593. DOI:10.1002/sce.21066

Martin, A.J., Durksen, T.L., Williamson, D., Kiss, J., & Ginns, P. (2016). The role of a museum-based science education program in promoting content knowledge and science motivation. *Journal of Research in Science Teaching*, *53*(9), 1364-1384. DOI:10.1002/tea.21332

McManus P. M. (1988). Good Companions: More on the Social Determination of Learning-Related Behavior in a Science Museum. *The International Journal of Museum Management and Curatorship*, *7*, 37-44.

Orion, N., & Hofstein, A. (1994). Factors that influence learning during a scientific field trip in a natural environment. *Journal of Research in Science Teaching*, *31*(10), 1097–1120. DOI: 10.1002/tea.3660311005

Paris, S.G., Yambor, K.M. & Packard, B.W. (1998). Hands-on biology: a museum school-university partnership for enhancing students' interest and learning in science. *The Elementary School Journal*, *98*(3), 267-288.

Piscitelli, B. & Anderson, D. (2001). Young Children's Perspectives of Museum Settings and Experiences. *Museum Management and Curatorship*, *19*(3), 269-282.

Randler, C., Baumgartner, S., Eisele, H., & Kienzle, W. (2007). Learning at workstations in the zoo: A controlled evaluation of cognitive and affective outcomes. *Visitor Studies*, *10*(2), 205-216.

Rennie, L.J. & Williams, G.F. (2002). Science centers and scientific literacy: promoting a relationship with science. *Science Education*, *86*, 706-726.

Riedinger, K. (2012). Family connections: Family conversations in informal learning environments. *Childhood Education*, *88*(2), 125–127. DOI:10.1080/00094056.2012.662136

Rogoff, B., Callanan, M., Gutiérrez, K.D., & Erickson, F. (2016). The organization of informal learning. *Review of Research in education*, *40*(1), 356-401. DOI:10.3102/0091732X16680994

Shepard, C.L. & Speelman, L. R. (1986). Affecting environmental attitudes through outdoor education. *The Journal of Environmental Education*, *17*(2), 20-25.

Şahin, F. & Sağlamer Yazgan, B. (2013). The effect of research-based out-of-class laboratory activities on students' academic success. *Sakarya University Journal of Education*, *3*(3), 107-122

Tatar, N. & Bağrıyanık, K.E. (2012). Views of Science and Technology Teachers on Out-of-School Education. *İlköğretim Online*, *11*(4), 883-896.

Türkmen, H. (2010). Historical view of informal (out-of-class) science education and its integration into our education. *Çukurova University Education Faculty Journal* *3*(39), 46-59.

Türkmen, H., Doğru, Ö. & Özen Göktaş, Ş. (2018). Teaching science in informal learning environments: Secondary school students' views on the Sasalı wildlife park trip. *TURAN-SAM International Scientific Peer-reviewed Refereed Journal*, *10*(40), 641-650.

Yigit, N., Sivrikaya, E., & Guven, E.M. (2021). Determination of the Contribution of Station Technique in Informal Learning Environments (STiIL) to Learning Domains. *Journal of Turkish Science Education*, *18*(3), 371-388. DOI no: 10.36681/tused.2021.79