A Case Study: Activity-Based Learning Process Prepared By NTC's (Nikola Tesla Center) System of Learning Approach

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Abstract

The NTC (Nikola Tesla Center) system of learning is an activity program designed to promote the development of motor skills and cognitive abilities in preschool and school-age children. This research aims to investigate the activity-based learning process prepared by NTC system of learning approach. In this qualitative research, case study design was used. The research group consisted of 34 fourth-grade students and four female teachers from a public primary school in the 2018-2019 academic year. Data were collected by using semi-structured interview and observation techniques. The research data was collected after 12 lessons on eight Flags. In the social studies course, themed activities based on the NTC system of learning approach were prepared by the researchers. Descriptive analysis method was used to analyse semi-structured interviews with teachers, and the content analysis method to analyse semi-structured interviews with students. According to research results, students described the flag-country matching, classifying flags according to their characteristics, learning colours, shapes, and emblems on the flag, and learning the capitals and national anthems of the countries as activities they liked. Research suggestions include implementing them at different levels of education and structuring them mainly for musical and motor skills development.

Keywords: NTS System of Learning, Activity-Based Learning, Learning Approach, Logical Thinking, Case Study

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INTRODUCTION

Children who learn subjects through a system based on memorization experience a transition to a system based on thinking, they learn the subjects by research and inquiry with changing educational paradigms. Activities for developing children's cognitive and motor skills are very important from early childhood in order to develop their existing potential. The NTC (Nikola Tesla Center) system of learning is an activity program designed to promote the development of motor and cognitive abilities for pre-school and school age children. This training program is based on research findings in the field of neurophysiology and pedagogy. The purpose of the programs is to apply the information while using it. Functional skills and creativity of children develop with the integration of knowledge. According to the basic proposition of NTC's methodology, motor development plays an important role in the cognitive development of every child. Children, at their school age, need a lot of physical activities in their developmental stages. The implementation of the NTC system of learning allows children to develop their motor skills and promotes physical activities. The NTC system of learning includes sensory, cognitive and motor development in children. This program has been utilizing since 2009 by the Teachers' Association of the Elementary School of the Republic of Serbia for "fostering of intellectual development of gifted school children and the discovery of gifted children". Initially, the program was consisted of short workshops implemented in three school classes and was recognized as the best of the 20 programs, accredited and implemented by the ministry of preschool and primary school education (Rajović, 2014a). Today, the NTC Program is used in 17 European countries; 7 of them have been approved by the Ministry of Education (Serbia, Slovenia, Croatia, Czech Republic, Montenegro, Macedonia and Bosnia and Herzegovina), while others (Italy, Greece, Sweden, Iceland, Hungary, Romania, Bulgaria, Switzerland, Slovakia, and Sierra Leone) carried out the program in cooperation with educational institutions. The mission of the program is realized through summer camps for children, with seminars, conferences and workshops accompanied by parents and teachers. The NTC (Nikola Tesla Center) system of learning and its author, Rajovic, brought new information's in this field, since knowledge from the fields of pedagogy, neurophysiology, psychology, genetics, and special education have been combined and simple, but yet effective program was created to help the stimulation of children's intellectual abilities at the early pre-school and school age (Dolezalova, 2014). The NTC program stands, for a name of Nikola Tesla Center, where a pilot research has been conducted and the program itself created. The core of the program is based on clinical findings of principles of the human brain, which leads to the fact that a pre-school period plays an important role in predetermination of future learning styles, memory, intelligence, attention, and potential giftedness. Such skills can also predetermine child's future high career (Rajovic, 2014a). The NTC system of learning promotes special exercises designed to stimulate the formation and the development of new brain synapses.

The program is dedicated to the development of functional thinking and is also designed to stimulate development of intellectual potential of each child (Dolezalova, 2014). Rajovic (2014b) states that playing is very important for children development. It has reached their biological potential in terms of how children should be prepared for the challenges they may face in the future and emphasizes that play-based learning should take place in school activities. The basic game activities as running, jumping, crawling, climbing, standing upright etc. are characteristic human activities that shapes our development, especially our brain, the organ responsible for survival. In this shape all parts of the brain work in a connected and synchronized way (Rajović, Stenovec & Berić, 2015). Most of the brain development occurs during the first years of life, during a dynamic synaptic change; Most of the synaptic connections are known to occur until the age of 12. The child should have a stimulating environment at every stage of development (Rajović, 2016). The games that children often play such as rotation on their axis, jumping, balance, climbing trees, objects, and tables are useful activities for the brain to create synaptic connections. The philosophy of this program is that children see school as a way of having fun. In this way, learning and playing games will be equal. The important point is, if we are forcing children to study, this is contrary to their physiology; with time they won't want to attend school and they will start resisting in learning how to read, for example (Rajovic, 2012a). Children can win the following features through game activities:

- Classification – the child classifies objects according to some characteristic, for example, they separate white from red balls.

- Seriation – the child lines up objects according to their size (for example, big ball, and then medium sized and small).

- Analogy – It allows children to find similar aspects by comparing concepts, for example, we ask the child what similarities between the Irish and Italian flag are, but that the Russian and French don't have. The child would analyse those flags in its head and say: "The colour is green".

- Association – it helps with everyday life. The association cortex is a prominent part of the human brain and a whole network of synapses is developed just for this important region of the brain.

- Abstraction – Recognizing symbols of abstract concepts that children see in their environment (Rajovic, 2015).

The Basis of the NTC System of Learning and Findings from Neurophysiology

According to Robert Stufflebeam (2008), "Neurons are the basic information processing structures in the CNS. Everything occurs above the level of neurons qualifies as information processing, too. But nothing below the level of neurons does." However, the intelligence not only depends on the number of inherited neurons but also on the synapses, which, as Robert Stufflebeam (2008) explains are "connections between neurons through which "information" flows from one neuron to another." The number of created synapses depends on the number of given stimuli and that is the ideology of the NTC system of learning. The higher the number of synapses is, the higher the intelligence and chance of development for potential giftedness will be. To achieve this, the human brain needs to be constantly exposed to a great number of stimuli not to slow down the process of development, as Markus Butz stressed (Forschungszentrum, 2013), "A neuron that no longer receives any stimuli loses even more synapses and will die off after some time. We must take this restriction into account if we want the results of our simulations to agree with observations". The question is: When is the best time to start with the stimulation of the brain? Rajovic raises this question at the Mensa conference in March 2014 and presents new findings showing that the research goes far beyond the school age. Nowadays, the pre-school period appears to be in the center of attention and scholars suggest that the creation of the synapses can be surprisingly rapid and numerous, as the natural fight for the domination of the neurons takes place until the age of six, "The preschool years are the time in which the brain begins to maximize efficiency by determining which connections to keep and which to eliminate" (Eddie, 2007). One of the main features of the NTC system of learning is learning to read through relational thinking. Rajovic (2014) claims that not by mechanical, but associative learning, it is possible to stimulate the brain intensively. Moreover, once children adopt certain techniques for associative thinking, the neuron structure and synapses in the brain allow them to develop intelligence higher than the general expectation is. The capacity of the human brain is not limited and what one experiences once will sustain in the brain. Therefore, the brain creates a great platform for creating associations (Dolezalova, 2014).

The NTC System of Learning phases

The program is realized in three phases:

PHASE I: Stimulation of the development of neural connections and pathways (Additional stimulation of synapses): This phase emphasizes the importance of the development of motor and graphomotor skills that helps the physical and intellectual development of children. Through a series of activities, children find the best solutions to overcome obstacles and develop their coordination,

and also to develop a sense of space. In today's school system, games such as rotation, jumping, and graphomotorics are unjustly neglected for the detriment of children and their overall development. Rajovic (2012) through the NTC system provides simple, effective and above all useful graphomotor exercises that stimulate physical activity, and according to the latest research, mental development of the child (Rajović, 2012).

PHASE II: Stimulating the development of associative thinking. In the second phase, several levels are shown, from recognizing abstract concepts to their connection and skilful handling through abstract classification, serialization and association.

Level 1 – Abstraction, visualization; Level 2 – Abstract classification and seriation; Level 3 – Associations, music.

Most children spontaneously recognize abstract symbols, but eventually they lose interest because parents do not know how to lead them to a higher level of thinking that is extremely stimulating for the development of thinking processes. It is precisely NTC that finds transitions to more complex forms of abstract classifications and serialization, which is the basis of the development of mathematical /logical intelligence (Rajovic, 2009).

PHASE III: Stimulating the development of functional thinking: The development of functional thinking is an imperative of keeping in step with the education system of developed countries. NTC encourages the development of functional thinking with the help of puzzling questions and stories that children are happy to solve. The development of functional thinking is provided by reading mysterious stories to children, asking mysterious questions so they can be able to think proximate, asking stimulative questions to provide divergent thinking etc. (Rajovic, 2012c).

Methodology of the NTC system of learning

The methodology of the NTC system of learning promotes the motor activities. Motor activities are generally those that enable continuous movement and consist of graded exercises, from easy to difficult. A child needs a good explanation of the technique, to get some time to adopt a particular movement and get the chance for its execution (Dolezalova, 2014; Rajovic, 2014b). The Methodology of the NTC system of learning also provides visual focus. According to Rajovic (2014b), the visual focus can be practically supported by quick eye movement, watching a moving object, running and jumping over objects. There are various games for the development of conceptual thinking in the methodology of the NTC system of learning. The recognition of abstract symbols is one of the most important and complex learning abilities. There are so many different views on where to start teaching abstract symbols to children, but the NTC system of learning starts the program by working with flags, car brands, and traffic signs. However, any commonly recognized symbol, such as brands of products, sports clubs, may also be used. It is known that musical activities shape the development and personality of children. According to the methods of the NTC system of learning, voice associations are also important in developing meaning and enhancing memory (Rajovic, 2014b). Dolezalova (2014) refers to children's possibility of describing music which acquires a basic knowledge of the connection between rhythm, melody, harmony, tempo, dynamics, and tones while listening to various songs. Story puzzles allow children to have fun. In general, story puzzles aim to provide information about the world and initiate logical reasoning. Rajovic (2014a) also recommends story puzzles, as they support the children's mental development.

Advantages of NTC System of Learning

Ranko Rajovic (2014a) explains that after he conducted a two-year research, the hypotheses were supporting the fact that the method contributes to the stimulation of the human brain and that individual intellectual abilities of children are developing. The advantages of the NTC system of learning can be summarized as follows.

- Raise in the level of intellectual abilities of children who participate in the program;

- Coordination of movement and motor skills is being developed;

- The speed of thinking and reasoning (functional knowledge) is being developed;

- All children benefit from the program, and this is especially useful for the detection of gifted children and for encouraging the development of their talents;

- The number of neural connections is enlarged, which along with specific exercises, increases the capacity of the brain for processing information.

The NTC system of learning is a very useful teaching program for improving a child's mental development, and with its unique teaching style, it focuses on brain development and the child's natural need to move, turn, jump, run, and learn. The primary role of the NTC program is to use discoveries in the field of neuroscience in classrooms and everyday life. In this context, the study aims to examine the activity-based learning process prepared by the NTC system of learning approach. The sub-problems of this research are:

1. What are the views of primary school students about the activity-based learning process prepared by the NTC learning program approach?

2. What are the teachers' views on the activity-based learning process prepared with the approach of the NTC system of learning?

3. What are the teachers' observations regarding the activity-based learning process prepared by the NTC system of learning approach?

This research aims to increase the quality of higher-level thinking skills in terms of students and the curriculum in Turkish education system. It is believed that participation of students in learning process with fun will contribute to the studies in this field.

METHOD

Research Design

In this study, a case study design, which is one of the qualitative research models, was used. Case study enables the researcher to examine a case or event in detail that the researcher cannot control under certain circumstances based on cause and why questions (Yıldırım & Şimşek, 2011). Case studies are a methodological approach in which a situation is described and examined in detail, within a certain time (Chmiliar, 2010; Gerrring, 2007; Merriam, 2013). Creswell (2007) states that in the case study; the researcher collects data with various collection tools (interviews, observations, documents, etc.) from several sources within a given period, using a qualitative research approach defining a situation or themes depending on the situation. In this research, a case study is seen as an effective research model in terms of a detailed analysis of the activity-based learning process prepared by the NTC (Nikola Tesla Center) system of learning approach.

Research Group

Detailed studies are carried out on small groups following the nature of the qualitative study (Patton, 2002). However, in qualitative research, it is important to create more qualified, rich and deep information and data set with the relevant situations (Yıldırım & Şimşek, 2011). The fact that the data obtained from the case studies are strong in the context of reality and allow generalization of an event or a theme from a case, it is possible to synthesize an existing social reality event in detail (Cohen,

Manion and Morrison, 2000; Hancock and Algozzine, 2006). The research group consisted of 34 (18 males, 16 females) fourth-grade students in a public primary school in 2018-2019 academic year and 4 female teachers (Primary school teacher, Gym teacher, Music teacher and English teacher) which carried out the activities in this primary school. Convenience sampling technique was followed in the determination of research group. In addition, the process was initiated in terms of voluntary participation of students and teachers. For the ethics of the research, the names of the teachers participating in the research are kept confidential and coding are used for the teachers as T_1, T_2, T_3 and T_4. The fourth-grade students who participated in the study were given codes like S_1, S_2 …$S3_4$.

Data Collection Tools

Interview and observation techniques were used to collect the data for this research. In this context, two different forms were prepared for the two research groups using the activities of NTC (Nikola Tesla Center) system of learning; observation and interview form for teachers about their application of the program in a classroom environment; and interview form for fourth-grade students in primary school. While preparing the observation and interview form, literature from related researches, documents, and expert opinions was used. The draft forms were presented to three faculty members who are experts and experienced in this field and their opinions were taken. The feedback from experts was reviewed and the forms were finalized. The observation form used in the research consists of two parts. In the first part, the observation is oriented on the physical condition features of the class. In the second part, there are semi-structured observation materials and explanations related to the observation section. Observation data of the research were collected during the implementation of eight Flag Themed activities prepared by the NTC system of learning approach to primary school fourth-grade students for 12 lesson hours within the program of Social Science class. As a data collection tool, a semi-structured interview form consisting of non-directive open-ended questions with teachers and third-grade students was used. The interview data of the research were collected by interviewing the teachers and students after the implementation of the activities prepared with the 12-lesson hour NTC system of learning approach. During the interview process, it was ensured that the research groups responded to the questions positively, honestly and correctly. In addition to questions prepared for the interview, alternative questions and probing questions were asked to provide a more convenient understanding during the interview. In this way, it was easier for the participants to understand the questions (Yıldırım & Şimşek, 2011). The interviews with teachers and students were conducted face-to-face. A voice recorder was used during the interviews, and they lasted approximately 15-20 minutes.

The following questions were asked to teachers in the semi-structured interview form:

1. What do you think about the implementation process of flag-themed activities?

2. How do you evaluate flag-themed activities in terms of student's earnings?

In the semi-structured interview form, the fourth-year primary school students were asked the following questions:

1. What do you think about the application of flag-themed activities?

2. What was your favourite flag-themed activity? Could you please explain the reason?

3. What was the most difficult flag-themed activity for you? Could you please explain the reason?

4. In addition to these flag-themed activities, what other activities would you like to do?

Application Process

The application period of the research lasted for six weeks (two lessons per week) in a total of 12 hours. On the theoretical basis of the NTC system of learning the researchers prepared activities aimed at improving both the cognitive and motor skills of the students and integrating the information so that the students could learn by applying knowledge and use them functionally. The activities prepared by the researchers were formed by examining the gains in the unit 'The life in our country' in the Social Science classes. The information on the content and applications of 'flag-themed' activities prepared with the approach of the NTC system of learning is given in Table 1.

Table 1. Content Information on Flag Themed Activity Applications Prepared by NTC System of Learning Approach

Week	Content
1st Week	Activity-1: The first activity is implemented. The aim is, at the end of the first activity each student is expected to say which country's flag is shown. Students should be able to match the 25 European flags identified at the end of this activity with their countries. Firstly, the students are introduced to 25 European countries' flags. These countries are Turkey, Azerbaijan, Greece, Bulgaria, Ukraine, Romania, Russia, Italy, Germany, France, Bosnia and Herzegovina, Croatia, Austria, Poland, Finland, Sweden, Norway, Macedonia, England, Albania, Portugal, Luxembourg, Holland, Estonia and Spain. During the activity learning process, students were asked to explain the colors, shapes, symbols, stars… of flags and to think about them. Students are asked to match the flag and country. Identify similarities and differences in flags. In order to provide the beginning of functional thinking, students are asked the following questions: The flag of which countries has a star? The flag of which countries has a circle? Which geometric shapes are used in the flags of countries? Which countries have the symbol + in their flag? In the flag of which countries has horizontal lines? In the flag of which countries has vertical lines? Thinking about the colors of the flags, which color is most used? Which color is not used at all? Are intermediate colors or primary colors used? Which color is least used in flags? What are the minimum and the maximum number of colors that make up a flag? Or in which countries flag has a blue color? Or red color? And after one color questions, students were expected to match the flag of the countries with two colors.
2nd Week	Activity-2: Application of Activity-2 is made. After the students learn how to match the name of the countries with the flags correctly, and after they start the functional thinking process regarding the characteristics of the flags and the countries, then the country-flag-national anthem activity is started. Within the scope of this activity, students are listening to the national anthems of the countries they have learned the flags, before. They are also asked to examine the national anthems as those with a fast rhythm, slow rhythm, excited and emotional ones. While listening to the national anthems of the countries, students are asked to read the given text of the anthems and to think about them. At the end of this activity, students are asked to perform rhythm using their body while listening to the national anthem of the countries.
3rd Week	Activity-3: Application of activity 3. Children, who already learned how to match the flags with the country, are given problem situations open-ended questions to enable them functional thinking: Which country flag has horizontal lines and three colors, one of which is red? Which country flag has a star in the flag and one of the colors in the flag is white? Which countries have the + symbol on the flag and one of the colors in the flag is blue?After this activity, students are asked to draw and paint one of the flags they memorized other than the Turkish flag. Students are asked to write their names in the lower right corner without writing the name of the country. The students are then asked to make a plane from their drawing paper and to stand up separated in two rows. Students are asked to throw their planes, they made from the flags to each other. Each child takes the paper falling nearest to him, and then one by one, in turn, tells which countries flag is in his hand and by whom it was drawn, and he shows it to his friends. If he says it wrong, he is corrected by the student who drew the plane. The student who draw the plane and follows and controls his friends' answer.
4th Week	Activity-4: Application of activity 4. Secondary and tertiary concepts are given to students after they learned the flag- country matching. Flag-country and secondary-tertiary concepts are given with visual cards. This makes it easier for the students to match the flags with a picture from the country. These visual pictures are chosen monuments, sculptures or famous architectural structures of the countries. There were also clothes, food, grown products, etc. related to the country. For secondary concepts: After showing the flag-country; the capital of the country is taught. Turkish flag-Turkey-Ankara France Flag-France-Paris Macedonian Flag-Macedonia-Skopje and so on. For tertiary concepts: Turkish flag-Turkey-Ankara- Ataturk's Mausoleum France flag-France-Paris-Eiffel Tower Flag of Bosnia and Herzegovina- Bosnia and Herzegovina- Sarajevo-Bosnian burek (traditional meal).

	At the end of this activity, each student is asked to match the secondary and tertiary concepts related to the shown flag. Activity-5: Application of Activity 5. Students are playing a game using their motor skills to reinforce the conceptual matching of the countries and flags. In the game, a racecourse is prepared to improve the student's motor skills. 25 cards with countries' flags and secondary-tertiary concepts are prepared. Prepared cards are placed on the floor with closed back. Students are asked to fulfill the instructions given in accordance with the description. For example: He jumps forward five steps on the right foot and gets to the side of the card, then jumps two times on both feet next to it, then takes the card and says the name of the country, capital, and monument linked with the flag on the card he took. With his hands on the back, walking reverse back eight steps, the student takes the card with the flag on it and explains the name of the country, capital, and monuments linked with the same flag. While holding his left foot with his right hand, jumping four times forward, the student is asked to pick the card and say the name of the country, capital and monuments linked with the flag on the card. The main goal of this activity is to improve students' motor skills and also to reinforce what they have learned by having fun outside the classroom.
5th Week	Activity-6: Application of activity 6. Students are taught to place countries on a planar map of Europe according to flag and country shapes. After placing the countries with flagged shapes on the map of Europe, they are asked to pay attention to visual focus on the countries sizes in order to make a comparison between them. For example: A student is asked to find Russia-Turkey-Bosnia and Herzegovina on a given map, and then to specify the ranking according to their size. Within the scope of this activity, after learning the national flags, students are enabled to learn the locations of countries on the world map. The flags of 25 European countries are given to the students in mixed, double and triple flag groups, and they are asked to explain which countries they are and find them on the map. Activity-7: Application of activity 7. Students work on the map. After learning the locations of countries on the map of Europe, the following questions for functional thinking improvement are asked. Which European countries are on the borders with Turkey? Which countries are north-west of Turkey? Which countries are located in the east of Germany? Which countries are on the east of…….? Which countries are on the west of …….? Which countries are located in the south of …….? Which countries are located in the north of ………? Which countries are in the north-east of ………..? Which countries are in the north-west of ………? Which countries are in the south-west of …….? Which countries are located in the southeast of ………? Which country has a border with only one country? After this stage, secondary questions are asked in the form of: On the route from Turkey to Germany, which countries are passed through? Which countries do you pass from country A to country B? They are asked to respond with the shortest route and the longest route. Which country is not on the way when traveling from country to country B? Which countries do you pass from country A to country B? This activity aims to learn the secondary and tertiary concepts of the flags, as the location of the countries on a world map, the neighbors and to learn which countries are on the direction from one to another.
6th Week	Activity-8: Application of activity 8. In this activity, students are given flags of countries and basic key concepts. To analyze what students have learned, a card selection game activity is performed in the last stage. Students are asked to select cards with countries' capital, architectural structure, etc. they have learned before. They are also asked to locate the country according to the characteristics of the cards. Students go to the blackboard and write sentences about the characteristics of the country they choose from the card, and their classmates are asked to guess the name of the country. This activity is done as a reverse tabu activity, by giving the secondary, tertiary concepts, and the flags of the countries, students are expected to know the country.

In Table 1, eight "Flag Themed" activities prepared by researchers with NTC system of learning, the approach was conducted during 12 lesson hours, with primary school fourth-year students within the scope of Social Science class. During the research process, activities were applied to the students for six weeks and the opinions of the students were taken. Also, the opinions of the teachers about the implementation of the activities were also taken and the observation was made by four teachers.

Data Analysis

As data collection tools in this research, observation and interview form for the teachers about the implementation of the activities prepared in the classroom by NTC (Nikola Tesla Center) system of learning approach, and Interview form for fourth-grade students in primary school was prepared. Straus and Corbin (1990) proposed different methods in the approaches used in the analysis of data in the case study. Methods used to analyse data in case studies are classified as descriptive and content analysis (Straus and Corbin, 1990; Yin, 2003). The descriptive analysis method for qualitative

research was used to analyse the semi-structured interviews with the teachers. The data obtained from the descriptive analysis were summarized and interpreted according to the themes. The content analysis method for qualitative research was used to analyse the semi-structured interviews with the students. At each participant level, content analysis was conducted to reach concepts and relationships that could explain the data collected in the interview form (Yıldırım & Şimşek, 2011). The data obtained from the observation form structured by the teachers about the implementation of the activities prepared in the classroom environment by NTC (Nikola Tesla Center) system of learning approach and the results of the notes held during the observation were descriptively expressed. The results of the analysis are shown in tables. As in all studies, validity and reliability are very important in the case studies, too. The internal validity of the studies is ensured by diversification of case studies, obtaining opinions from experts about the data, having the obtained data checked to the source, and the active participation of the participants in the whole process (Merriam, 1998). In terms of external validity, a rich definition, explaining the specific characteristics of each situation, and using different situations were stated. In qualitative research, the credibility, transferability, dependability, and confirmability of the research's reliability are met. Convincing means the extent to which the findings are consistent with reality; transferability, the extent to which the findings can be adapted to other contexts, reliability, achieving the same findings with the same participants in the same context. On the other hand, it can be said that the results of the study are not based on the researchers' experience, but rather it depends on the opinions and experiences of the participants (Arastaman, Öztürk Fidan & Fidan, 2018; Shenton, 2004). To ensure the verifiability of the research, the results of the data were obtained in a systematic, clear and understandable language. In order to meet the criterion of transferability, direct quotations were used to reveal the views of the teachers and students who participated in the research. The names of the teachers were kept confidential and coded as T1, T2… T4; the fourth-grade students who participated in the study were given codes like S1, S2 …………..S34. Consensus / (Consensus + Disagreement) x 100 formula of Miles and Huberman (2015) was used to ensure the reliability of the data obtained in the study. The reliability ratio of the researchers was 93% for teachers and 91% for students.

RESULTS

In this section, first of all, the findings of the semi-structured interviews with teachers and fourth-grade students about the practices of the activities prepared by the NTC system of learning approach are explained. After that the observation findings for the process of implementation of the activities of the teachers are presented.

Teachers' Views on the Application Process of the Activities Prepared with the NTC System of Learning Approach

The opinions of the teachers (Primary school, Gym, Music and English teachers) about the activities prepared within the framework of NTC system of learning program were given within the framework of analysis created with themes, quotations, and inferences. Based on the research data, direct quotations were also included about teachers' opinions. In this context, in Table 2 below, the findings obtained from the teachers' views on the implementation of the "Flag Themed" activities are given within the framework of the analysis formed as topic, statements, and reviews.

Table 2. Findings Obtained from Teachers' Views on the Application Process of the Activities Prepared by NTC System of Learning Approach.

Theme	Statement	Review
Application Process of Activities	T$_1$: During the implementation of the flag-themed activities, students were interested in learning the national flags. It is a good way to ensure that students engage in lessons in a way that attracts their attention. All of the students raised their hands in almost every activity and asked to speak and answer about the subject matter. Some students said they needed to do more lessons. They said they needed social science lessons and more flag-themed activities. T$_2$: The lessons implemented for the flags of countries passed effectively and	*Willingness to learn other countries flags *Attendance and attention during the lessons *Efficient

	efficiently. While even some adults are having difficulty in learning the national flags, the students learned the flags with great interest by thinking functional. Almost all the activities for the students were quite remarkable, but they learned more easily and quickly with the activities in which they used their motor skills, especially inside and outside the classroom. The activities were very functional for students in different areas of intelligence. Thus, almost all students in the classroom were activated. T$_3$: During the implementation of flag-based activities in the classroom, students were very eager to learn. They easily learned the colors of flags and classified the symbols on them, by using logical thinking strategy. Some students were more interested in secondary and tertiary concepts as well as a country and flag matching. For example, they wanted to learn more about the famous architectural structures, food, and clothes of the countries. T$_4$: In the national anthem and country activity, students listened to the national anthems of the countries flags they learned before, with great interest. The rhythm of the anthems was very interesting for them. While listening to the national anthem, the lyrics of the anthem were shown on the smart board both in the country's alphabet and in Turkish. The students found country-flag-anthem activity very differently. In particular, some students (those with dominant musical-rhythmic intelligence) questioned the alphabets of countries, the meaning of the words in the anthem, and tried to accompany the anthems themselves.	Activities processing with students' effectiveness in the process. *Willingness to take the right to speak and participate in the lessons. *Using the functional thinking process *Ensuring the active participation of students with different types of intelligence

When the opinions of the teachers were examined, it was revealed that students participating activities wanted to learn more flags other than the 25 flags from the European countries. They actively participated in the process of learning and with a lot of interest as well. Basically, teachers stated that students used the functional thinking process in the implementation of the activities prepared within the framework of NTC system of learning. Teachers evaluated the application of activities prepared within the framework of NTC system of learning in terms of student achievements. In this context, in Table 3 below, the findings of the teachers while they evaluated the "Flag Themed" activities in terms of student achievements; topic, statement, reviews are given.

Table 3. Findings Obtained from Teachers' Views on Student Achievements in Application of Activities Prepared by the Approach of NTC System of Learning

Theme	Statement	Review
Students Achievements	T$_1$: I think that flag-themed activities are effective for students' development. Because during the activities, students learned the colors of the flags, anthems, secondary and tertiary concepts of the countries… During the activities, students' cognitive classification skills have improved. For example, they classified countries flags according to their colors and geometric shapes. The biggest achievement is that they learned the flags of the 25 European countries and their secondary and tertiary concepts. T$_2$: During the classification of national flags, students improved their classification skills. While students were learning the flags, they made correlations with the gains they learned in other lessons (especially in mathematics). For example, by associating with the geometric shapes they learned in mathematics, they expressed which geometric shapes are present in which country flag. They learnt the national symbols on the flags and their meaning. With the active learning methods, like the playing cards, students were able to learn the national flags, secondary and tertiary concepts. T$_3$: Students have different learning styles. In terms of student achievements, these activities were instructive as they had different learning styles. Teaching the countries on the world map developed the students' concepts of specific geographic location and geography discipline. An interdisciplinary approach was also achieved by making connections with other lessons. For example, the shapes on the flags were given in relation to the mathematics lesson in geometric shapes. Transferring the information learned between classes and reinforcing the content of the lessons learned in one class provided effectively and quality teaching for us. T$_4$: It is very important for students to have activities that support developmental characteristics of cognitive, affective and psychomotor areas. With these activities, students gained the ability of classification and comparison skills and functional thinking skills. The activities appeal to different intelligence areas which enabled the students to participate in the	*Effectiveness of activities in terms of student's development. *Learning the basic information's about 25 selected European countries. *Realization of the transfer principles of teaching. *Reinforcing the lessons learned in other classes. *Application of activities with fun, active participation. *Improving the student's general culture knowledge. *Learning the geographical location of the countries as a basis of geography class. *Contributing to cognitive, affective and psychomotor development of students. *Students gaining the

process with interest. The students learned the flags of 25 European countries with interest and were very eager to learn even more flags. I think that such activities are beneficial for raising awareness about social subjects. It is also important for students to have knowledge about the flags, national anthems, capitals, architectural structures or cultural characteristics of these 25 countries in terms of general culture. I think that the number of such activities should be increased, and such practical activities should be expanded in the curriculum.	ability to classify. *Students gaining comparative skills. *Improving students' functional thinking skills

When the opinions of the teachers were examined, it was found that the students learned the basic concepts of the 25 European countries (flags, capitals, their position on the world map, architectural structures, etc.), and also while learning they gained the ability of comparison and classification, which contributed to all developmental areas, used and reinforced by transferring what they learned to other classes. The most important gains from the activities prepared within the framework of the NTC system of learning is the functional thinking process for the students.

Students' Opinions on the Activities Prepared by NTC System of Learning Approach

The opinions of the students about the activities prepared with the NTC system of learning program are given within the framework of the analysis formed with a topic, statement, and review. Depending on the research data, direct statements were also included in the interview about the students' opinions. In this context, fourth-grade primary school students evaluated the activities prepared within the NTC system of learning program. In Table 4 below, the findings obtained from the students' views about "Flag Themed" activities are given in the form of topics, codes, and frequencies.

Table 4. Findings of the Students' Views on the Activities Prepared by NTC System of Learning Approach

Theme	Codes	Frequencies
Students Achievements	Learning flags from different countries	18
	Classification of flags of countries according to their colors and shapes	14
	Learning the national anthems of countries	12
	Learning the architectural structures of countries	10
	Learning the locations of countries on the map	8
	Learning capitals of countries	7
Students' Emotions during the Implementation Process of the Activities	Happy while doing the activities	19
	Participated in activities with pleasure	13
	Having a lot of fun	12

When Table 4 is examined, students' views, on "Student Achievements" topic, for learning different countries flags (f = 18), classification of flags according to their colors and shapes (f = 14), learning the national anthems of countries (f = 12), learning the architectural structures of countries (f = 10) points are observed to be concentrated. As for the topic "Students Emotions during the Implementation Process of the Activities", being happy while doing the activities (f = 19), participating in activities with pleasure (f = 13), and having a lot of fun (f = 12) parts were concentrated. Some of the student's views on this topic are given below.

"We have learned the flags of many different countries during the activities that our teacher made. While learning the flags both individually and with our friend, we developed a strategy by separating flags according to the colors, number of colors and geometric shapes on them. For example, which flags have horizontal lines and which have vertical lines? Which flags are having two colors? Which flags have emblems? In this way, we easily learned to group flags according to their characteristics" (S$_5$)

"...While learning the flags of the countries; we were also listening to their national anthems. This was a very enjoyable activity for me. The national anthem music of each country was in a

different rhythm and having a chance to learn the words in the national anthems of the countries, was a very good experience for me. We also learned about the capitals of the countries, which was useful information for us" (S$_9$).

"The activities where we have learned the flags of the countries were very, very enjoyable. I've always wanted to learn this subject during our Social Science lessons. We had a lot of fun while learning the flags and the architectural structures of the countries. During one of the activities, our teacher showed us the location of the countries on a map. Before we learned only the map of our country Turkey, and some different regions and provinces, that's why I was very happy to see so many different countries on the world map, and learn which countries are in the east, west, north, and south" (S$_{31}$).

Primary school fourth-grade students evaluated the activities prepared within the framework of the NTC system of learning and explained their favorite activities together with the reasons. In this context, in Table 5 below, the findings obtained from the students' views about "Flag Themed" activities are given in the form of topics, codes, and frequencies.

Table 5. Findings of the Students' Views on the Activities they Liked Prepared by NTC System of Learning Approach

Theme	Codes	Frequencies
	Making a flag-country match	20
	Classifying flags according to their characteristics	16
	Learning the colors, shapes and emblems on the flag	15
Liked Activities	Learning countries capitals	13
	Learning the national anthems of countries	12
	Learning famous architectural structure, cultural features	9
	Making a Plane with flag activity	7
	Motoric game activity with cards	5

While examining the students views for the "Liked Activities" topic, it is noted that making a flag-country match (f = 20), classifying flags according to their characteristics (f = 16), learning the colors, shapes and emblems on the flags (f = 15), learning the countries capitals (f = 13) and learning the national anthems of the countries (f = 12) are liked activities for most of the students. Only a few of the students decided to list the Making a plane with flag activity (f=7) and Motoric game activity with cards (f=5) as "activities they liked". The views of some of the students for this topic are given below.

"...From all the activities that our teacher made was country-flag matching. It was nice to group the flags according to their characteristics and learn the meaning of the emblems and symbols on some flags, such as the Croatian flag. Some flags are very easy to learn because there are so many colors in horizontal or vertical lines... Some of them are with only two colors...I can tell immediately which of the 25 country flags are having least colors..." (S$_{16}$)

"...In one of the activities, our teacher asked us to paint the flag of a country we learned outside the flag of our country. Without writing the name of the country, we wrote our names in the lower right corner and then we made airplanes and we sent them to our friends. Each student took the nearest plane, and then we all said the name of the country for the painted flag, and by whom, and then we showed it to our friends, and everyone checked each other's answer. It was so fun. I liked this activity very much..." (S$_{29}$).

"We played one game with flags, capitals, architectural structures of the countries we learned. And there was a track and cards in this game. Our teacher put the cards upside down on the floor and gave us specific instructions, and then she asked us to do it. In this activity, we jumped on one or two feet, we walked reversed and repeated what we learned while having fun in the schoolyard" (S$_{25}$).

The fourth-grade students of primary school evaluated the activities prepared within the framework of the NTC system of learning and explained the most difficult activities together with their reasons. In this context, in Table 6 below, the findings obtained from the students' views about the difficult "Flag Themed" activities are analyzed in the form of topic, codes and frequencies.

Table 6. Findings Obtained from Students' Views on Difficult Activities Prepared by NTC System of Learning Approach

Theme	Codes	Frequencies
Difficult Activities	Learning the east-west-north and south of every county	12
	Card selection activity	8
	Capital names for some of the countries	5
Difficulty Status	None of the activities was difficult for me	19

The data from Table 6 shows the students views for the "Difficult Activities" topic, were some of the students said that learning the east-west-north and south of every country (f=12), card selection activity (f=8), capital names for some of the countries (F=5), were difficult for them. Students' view on the "Difficulty Status" topic was mostly referring to not having difficulties in any of the implemented activities (f=19). The views of some of the students referring to this topic are given below.

"I didn't have any difficulty during any of these activities. Because the activities were not hard at all, they even made me easily learn a lot of new subjects with great fun and pleasure" (S17).

"In the flags activities, it was mostly hard for me to find the location of the countries on the world map. Because which country is east of the other country, which country in the west was an activity I hardly understand. Until now, we have only learned the provinces on the map of Turkey. In other words, while knowing only for our country, I had difficulty in learning which countries are in the north or south, or through which countries we have to pass while traveling from one country to another…" (S24).

"On the last activity we made, we choice one card and without saying the name of the country we were explaining countries' characteristics and expecting from our friends to say the name of the country. In this activity, for example, when the first characteristic was given by saying country with a red flag, many countries came to my mind, and then I could know the name of the country only when the capital was given because I forgot the architectural structures of some countries. Therefore, when I received a lot of information about features of the flags, sometimes I had trouble finding the country to which the flag belongs. This activity was similar to a taboo game that we played at home, but it was the opposite because we tried to find the name of the country by saying a lot of keywords. Maybe I had difficulties because it was different from the games I always play." (S34).

The fourth-grade primary school students evaluated the activities prepared within the framework of the NTC system of learning and explained the activities that can be done in addition to those they did. In this context, in Table 7 below, the findings obtained from the students' opinions about the activities that can be done in addition to the "Flag Themed" activities are given within the framework of the analysis formed as topic, codes, and frequencies.

Table 7. Findings Obtained from Students' Views on Additional Activities That Can Be Prepared by NTC System of Learning Approach

Theme	Codes	Frequencies
Alternative Activities	Learn all country flags	22
	Creating my own imaginary country and design a flag	18
	Learning different characteristics of countries (except capital, architectural structure, cultural characteristics)	15
	Solving country and flag puzzle on a smart board	14
	Learning the meaning of the colors and history of the flags	12

Designing the famous architectural structures of the countries, making a drawings competition	10
Learning the history of the countries (with which countries they had wars in the past, who is the enemy of these countries etc.)	9
Learning all national anthems	8
Being able to create art design from the flags we learnt.	7
Making a competition with tasting the famous food of the countries.	6
Going to the countries we learnt, with virtual reality application, visiting the country	5
Learning more subjects about the geographical location of the countries	3
Painting the flags	2

The data in Table 7, shows that students have proposed many creative new activities in the "Alternative Activities" topic. When the additional activities suggested by the students are examined, it is seen that they internalize the "Flag Themed" activities and they need activities that will carry the applied activities to a higher level. In the "Alternative Application" topic, they stated they want to learn all country flags (f=22), create their own imaginary country and design a flag for it (f=18), learn different characteristics of countries (f=15), solve country and flag puzzle on a smart board (f=14), learn the meaning of the colors and history of the flags (f=12), design the famous architectural structures of the countries and make drawings competition (f=10). In addition to this, students stated they would like to make a competition with tasting the famous food of the countries (f = 6) and travel the countries with virtual reality application (f = 5). The views of some of the students referring to this topic are given below.

"According to me, in addition to our activities, we should learn the flags of all countries. After these activities, I wanted to learn the flags of other countries, too. And also, in addition to these activities, after we learned the flags, architectural structures and capitals of the countries, it would be very nice if we could taste their famous food. After that, it would be very fun to make a competition where we will taste the food we have learned before, with closed eyes, and try to find out which country it belongs to. Since I really like eating and trying different tastes, this kind of activity came to my mind" (S₁₁).

"We could do activities for matching flags and countries on smart board. Besides, we could also make a competition quiz with kahoot applications. I would also like to learn about the enemies of these countries. In other words, which countries were in a war, who won, who was beaten, the meaning of the flags colors, emblems or shapes…that's why I think we could make more activities to learn all these" (S₂₃).

"I would like to create imaginary country and design the flag of that country by myself. I would like to design the flag of my own country according to the meaning of the colors and shapes I will use. Also, I would like to make ornaments for the flags we have learnt. It would be also nice if we had the opportunity to paint all the flags according to their colors, on a given shape, like the mandala application, for example. I think activities like painting and designing would be very enjoyable" (S₆).

"While learning the capitals of the countries we also learned about architectural structures, for example, when we learned about the Paris capital of France, we also learned about the Eiffel Tower. I saw once three-dimensional wooden Eiffel tower puzzles in shop. I would like to make famous architectural structures of some countries with these ready sets. Or I think it would be a different and beautiful activity to compete with our friends in designing architectural buildings with wooden blocks" (S₂₁).

"My mother is a computer teacher…She shows her students' pictures of certain places in the school with virtual reality glasses and makes applications where they can feel as if they are walking in those places and touching the structures they see. In addition to our activities, I think it would be nice if we could experience the same…so we could walk around the Eiffel Tower and feel like we're touching it without going to Paris…… for example, I haven't been in Ankara... it would be nice if there was visual reality for the Ataturk's Mausoleum in Ankara, like walking on the lion road or

touching the mausoleum of Atatürk…for countries we could never go to, we would feel as we have been there…and we would never forget that" (S₁).

Observation Findings of Teachers towards Application Processes of Activities Prepared with NTC System of Learning Approach

In this section, the findings obtained from the observations of the teachers towards the implementation process of the activities prepared with the approach of the NTC system of learning, are presented. Data collected with semi-structured observation form and observed behaviors, physical characteristics of the classroom environment are given by tables.

Observation Findings on Physical Characteristics of the Class where the Activities Prepared by NTC System of Learning Approach were implemented

According to the observation findings of the classroom where the activities prepared by the NTC system of learning approach were implemented; there are 34 students in the classroom. Two students sit in each row. The classroom has a smartboard, printer, and bookshelf. The different activities of the students are displayed on the panels on various walls of the classroom. There are pictures of Ataturk and panels showing the seasons on the walls. There are wardrobe cabinets for the students inside the class, the class is in the classical order and physical structure is suitable for teaching. Enlightenment in the classroom is also suitable for a learning environment. Implemented activities prepared by researchers with the approach of NTC system of learning were observed by the teachers according to the items in the observation form. Observed behavior items and activity numbers are presented in tables. In Table 8, observation findings regarding the effectiveness of the implementation process according to the teachers are given.

Table 8. Teachers Observation Findings for the Activities Implementation Process

Observed Behaviors during the Implementation of Activities	Activity Number							
	1st Activity	2nd Activity	3rd Activity	4th Activity	5th Activity	6th Activity	7th Activity	8th Activity
The content of the activity and the subject attracts the attention of the students.	✓	✓	✓	✓	✓	✓	X	✓
Students associate the subject with what they have learned in other classes.	✓	✓	✓	✓	✓	✓	✓	✓
Students make concretization for the activity.	✓	X	✓	✓	✓	✓	X	✓
Students actively participate in the lesson.	✓	✓	✓	✓	✓	✓	✓	✓
Students relate the activity to current issues and real life.	✓	✓	✓	✓	✓	✓	✓	✓
The activity improves the classification skills of the students.	✓	✓	✓	✓	✓	✓	✓	✓
The students follow the instructions in the activity.	✓	✓	✓	✓	✓	✓	X	✓
Students ask questions about topics in the activity.	✓	✓	✓	✓	✓	✓	✓	✓
Students express themselves easily.	✓	✓	✓	✓	✓	✓	✓	✓
Activity improves students' comparison skills	✓	✓	✓	✓	✓	✓	✓	✓
Activity improves students' functional thinking skills.	✓	✓	✓	✓	✓	✓	✓	✓
Activity improves students' psychomotor skills.	X	X	✓	X	✓	✓	X	✓
Students are willing to do activities.	✓	✓	✓	✓	✓	✓	X	✓
Activities enable students to be active in different fields of intelligence.	✓	✓	✓	✓	✓	✓	✓	✓
Students had fun during the implementation of the activities.	✓	✓	✓	✓	✓	✓	✓	✓

* ✓: Observed.   X: Not observed.

The observation findings of the teachers are examined in Table 8, according to them, students were active during the implementation of the "Flag Themed" activities, they associated the new subject with the subjects from other lessons They also determined that students developed their skills of classification, comparison, and functional thinking, and they were willing to do the activities. It is

shown that "Flag-themed" activities attracted the attention of the students and that they enjoyed learning with pleasure and fun. The students did not participate willingly only during the activities for learning the position of countries on the world map. If we compare this finding with the findings of students' opinions, it can be stated that the students did not participate willingly because they found this activity difficult. In this research, teachers observed that the characteristics of students of different intelligence types were taken into consideration during the implementation of the activities. Especially, students who have dominant kinesthetic intelligence and musical intelligence had high participation in various activities. It was also determined that students participated actively in learning the subject by asking questions in all activities.

DISCUSSION AND CONCLUSION

The activity-based learning process prepared with the approach of NTC system of learning was examined in detail through semi-structured interviews and observations. Teachers' opinions about the implementation process of the activities prepared with NTC system of learning approach showed that students wanted to learn more flags outside of Europe; they attended the classes with interest, and actively participated to the learning process. Basically, teachers stated that students used functional thinking process during the implementation of the activities. Teachers stated that these activities provide students the ability to compare, classify, and contribute to all developmental areas while encouraging the use of the functional thinking process.

The students described the activities prepared within the framework of NTC system of learning as activities in which they learned the flags of different countries, classified them according to their colors, shapes, learned the national anthems and architectural structures of the countries, have been happy while realizing the activities, participated in the process with pleasure, and learned while having a lot of fun. Students described some of the activities they liked mentioning: the flag-country matching, classifying flags according to their characteristics, learning colors, shapes, and emblems on the flags, learning the capitals of the countries and listening to the national anthems of the countries. On the other hand, they listed some of the activities they had difficulties with as: learning the countries in the east-west-north and south direction of the countries they have learned, the card selection activity, some countries' capital names which were hard to memorize. As an alternative to all the activities, students proposed many creative new activities. When the additional activities suggested by the students are examined, it is seen that they internalize the "Flag Themed" activities and they need activities that will carry the applied ones to a higher level. Students suggested activities like learning the flags of all countries in the world, designing the flag of their own imaginary country, learning more different characteristics of the countries, solving country and flag puzzles on the smart board, learning the history of flags colors, drawing the famous architectural structures of the countries, design competitions. In addition to these, students included the recommendations for countries' traditional foods tasting competition and tour activities through virtual reality applications. In the observations of the teacher to the activities prepared within the framework of NTC system of learning, it was determined that the students were active during the lesson, they associate the new subject with the subjects from other lessons, and they improved their skills of classification, comparison, and functional thinking, and they were willing to do all the activities. It was observed that students did not participate willingly only during the activities for learning the location of countries on the world map, because they found it difficult to learn. Considering the characteristics of students of different intelligence types in the implementation of the activities, it was observed that the participation of the students with dominant kinesthetic intelligence and musical intelligence was high.

Although there are no previous implementations of the NTC system of learning in our country, there are very few studies in the literature. In the qualitative study conducted by Dolezhalova (2014), in the master thesis "Implementation of NTC system of learning in English Kindergarten", six children at the age of six, attending a kindergarten, were attending activities implemented with the NTC system of learning for six months. As a result of the observations made as a data collection tool, she determined the individual differences in children before and after the activities. According to the results of the research, she stated that NTC system of learning improved students' knowledge level

provided longer attention and cognitive progress of the students. The findings of this study are similar to those of Dolezhalova (2014). It can be said that the activities prepared within the framework of the NTC system of learning for this research enabled students to improve their classification and comparison skills, actively participate by entertaining, and increased the use of the functional thinking process.

The following suggestions can be offered in the curriculum in the education system in Turkey, within the scope of this study, which contributes to improving the quality of high-level thinking skills of targeted students:

- Flags, capitals, secondary and tertiary concepts and national anthems of countries can be given by developing flag-themed activities based on continents. For example, the countries on the Asian continent, the countries on the African continent, etc.

- The flag-themed activities can be organized starting from general to specific, or based on the principle from close to far, starting from the nearest surrounding. Students can learn the geographical location of other countries with activities that include imaginary traveling starting from the countries around Turkey.

- The NTC system of learning can be evaluated, by implementing activities based on NTC system of learning and by reducing the number of flags for children at a preschool level.

- Activities prepared on the basis of NTC system of learning may include more activities for improving the student's musical and motor skills.

- Different activities can be created and implemented for learning the abstract symbols with the NTC system of learning methodology. For example, the NTC system of learning can be used for learning the traffic signs symbols.

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