Co-funded by the Erasmus+ Programme of the European Union

Report of the implemented observation regarding the project**:**

# “MATHS FOR MINIS”

## Erasmus registration number: 2108-1-DE02-KA202-005080

**Bitola, March 2019**

## INTRODUCTION

The project "Maths for minis" has the goal to offer new dimension of learning Math through which the children will gain mathematical experiences by themselves. From the museum "Mathematicum" in Gissen, Germany, were brought 15 different 'play stations' and the children involved in the project in Bitola had the opportunity to explore and learn by direct contact with the exposed objects thus finding logical solutions to the mathematical challenges. The traveling exposition "Maths for minis" is a collection of exponats for children from 4 till 8 years old. In a time frame of 90 minutes, groups of 20 – 30 children had the opportunity to visit the exposed exponats in Bitola in the period between 25th of February and 08th of March 2019. They learned individually by playing simultaneously developing their logic and also developing love towards the Math as a subject. The idea for developing a project like this came from the need to overcome the present situation form which is evident that the potential of the small children for approaching the mathematical phenomena is not accordingly promoted and has no priority in early education of children. The early childhood development is of exceptional importance for the development of children; it influences the right development of the brain at children and increases their readiness for school and later life. This project enables the children to get the chance for facing the mathematical phenomena and the everyday orientation in an important phase of their social education.

During the implementation of the project it is planned to implement observation of the children during their visit of the exhibition which would give a clear picture for their motivation during the use of the mathematical exponats, whether they are happy and enthusiastic with the activities, which 'play stations' left the biggest impact in them and which were less favorite, and also whether the children had difficulties in solving the mathematical challenges or they could solve them easily without any problems. Apart from the general observation of the children's behavior, SUMNAL has the goal to analyze the motivation and the success of the Roma children from Bitola, their capability to realize the activities by themselves and the level of positive results at the end of the activities. For this purpose we were able to include 23 Roma children, 10 male and 13 female.

## OBSERVATION AND RESULTS

The implemented observation was created according to planned directions and methodology of research. The observation was intended for defined goal example of 42 groups of children in Bitola form primary schools and kindergartens. The exhibition was visited by 891 children and for the purpose of the research were filled 47 questionnaires. It was visited by children from 1st to 3rd grade from the following primary schools in Bitola: "Dame Gruev", "Gjorgji Sugarev", "Kliment Ohridski", "Stiv Naumov", "Kiril i Metodij", Goce Delcev", "Elpida Karamndi", "Trifun Panovski", and children from the kindergarten "Snowflake". To the exhibition also came 44 students from the Faculty of pedagogy in Bitola in order to upgrade their studies regarding pedagogy and enrich their experience with innovative and interactive teaching methods.

The basic questions of the research which were supposed to be answered, are the following:

- What is the children's motivation during the exhibition?
- Do children communicate between themselves and qith the adults during the exhibition?
- Do children use all 15 'play stations'?
- To which extent are the adults included actively during the activities?

Collecting data is an organized activity focused towards recording of the teachers' attitudes and oppinions regarding the contribution of this kind of exposition to the target group as well as the achieved results from the visit of the exposition.

The basic method which is used in the research is the method of test as a base for collecting empirical data through written testimonies given by the respondents. The basic technique applied in the research is a survey, and the instrument is a questionnaire. In this research the written survey is used, which is implemented on respondents with developed written communication skills. The survey includes standardized questionnaire with 42 questions (see appendix 1). The questionnaires were given in printed form to the respondents, and the data was statistically processed in Excel by given percentage. The analysis and the interpretation of the received data is presented in this report, including the summary at the end. The following charts explain the respondents' attitudes and opinion. From the aspect of the demographic caracteristics of the respondents, the gender and ethnicity are also included which are another part of the research.

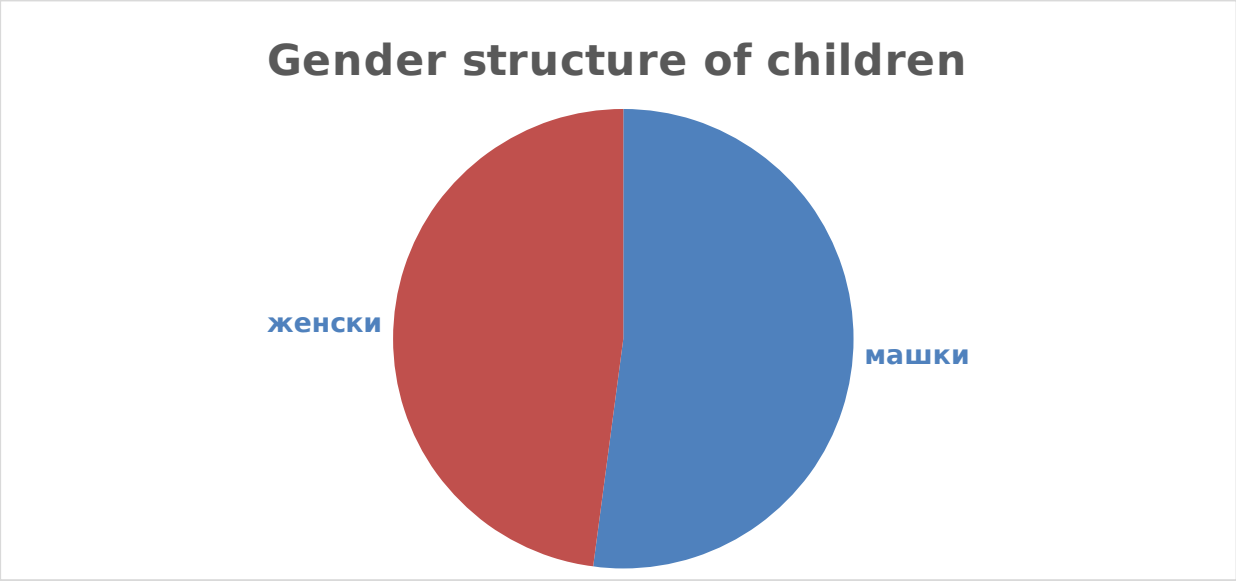


**Chart 1. Gender structure of children**

Chart 1 gives review of the gender structure of children. According to the received data it is seen that in the research were included almost the same amount of male and female children. According to this there were 52 % male and 48% female children included in the research.

## CHILDREN'S MOTIVATION

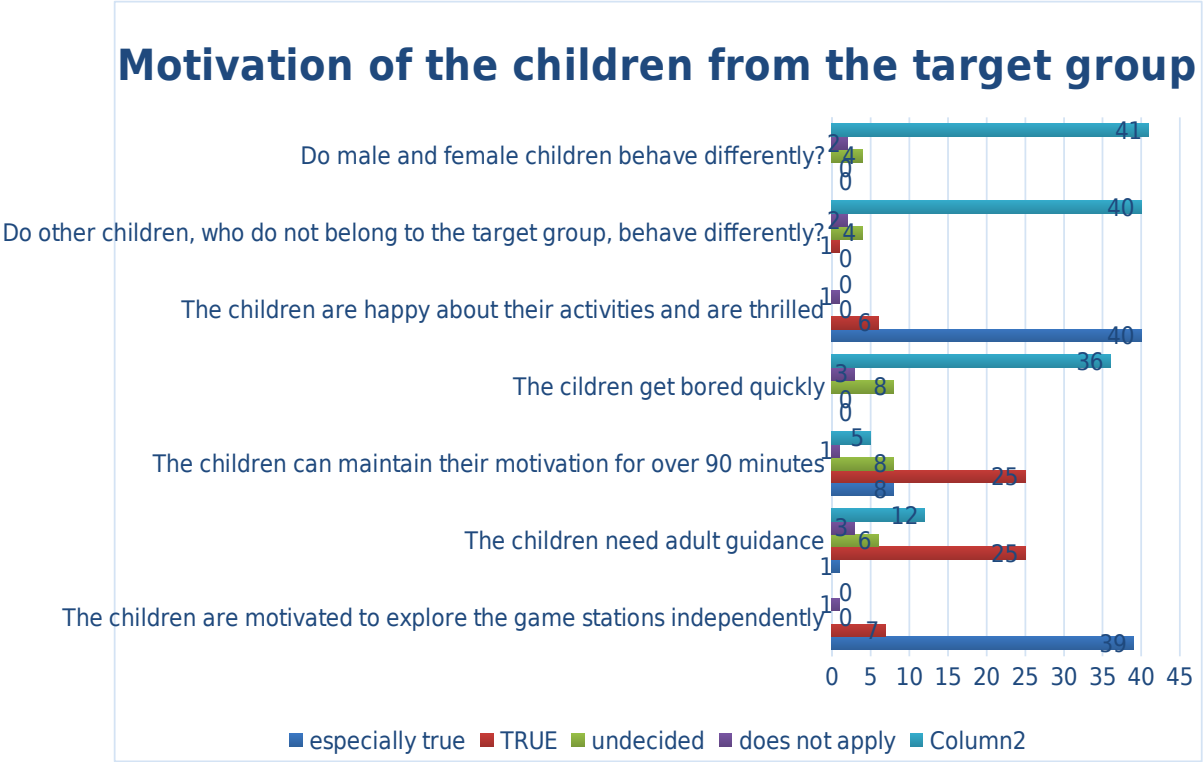


**Chart 2. Motivation of the children from the target group**

From chart 2 can be seen that the majority if the children were motivated during the activities. 39 responded ( 83%) that this is especially true, which means that the children show a lot of motivation during the activities. 15% decided to respond that this is true. Only 1 of the respondents, which is 2%, decided that this does not apply to the group.

Regarding the question: Do children need help from an adult?, only 1 responded wrote that this is especially true, 25 respondents or 53% wrote that it is true, 6 respondents could not decide, and 3 respondents wrote that it does not apply to the group. 12 respondents or 26% wrote that it is not correct at all. According to the results, we can conclude that more than half of the respondents perceived that children need adult guidance during the activities, while 26 % wrote that children can solve the mathematical problems by themselves with no help. Most of the teachers, which are 8 in number or 17%, responded that it is especially true, and 25 teachers or 53% responded that the statement 'Children can maintain their motivation for more than 90 minutes' is true. 8 teachers (17%) responded that it cannot be decided, 1 responded that it does not apply to the group, and 5 that it is not tru at all (11%).

Regarding the statement 'Children get bored quickly', none of the teachers responded 'especially true', or 'true'. 8 teachers or 17% wrote that it cannot be decided, 6% that it does not apply to the group, and the majority (36 teachers -77%) responded that it is not true at all.

The majority of the teachers – 40 teachers (85%) perceived that the statement 'Children are happy and thrilled with the activities' is especially true, and 6 teachers (13%) responded that it is true. Only 2% of the respondednts, or 1 teacher wrote that it cannot be decided, which

proves that the exhibition was successful and left a big and positive effect on children resulting with their happiness and satisfaction.

Regarding the question if other children which do not belong to the target group act differently, the majority of the respondents wrote that it is not true (42 teachers or 89%), while 1 responded wrote that it does not apply and that it is true. 4 teachers (9%) responded that it cannot be decided.

There are similar observations from the respondents for the next question: 'Do male and female children act differently'? 1 teacher responded that it is especially true, 2 teachers could not decide, other 2 responded that it does not apply, while 42 teachers or 89% responded that male and female children were equally involved in the activities. As additional statements regarding this question, teachers wrote: 'Children work according their interest and knowledge, not according gender or ethnicity.'

**CHILDREN'S ACTIVITIES**

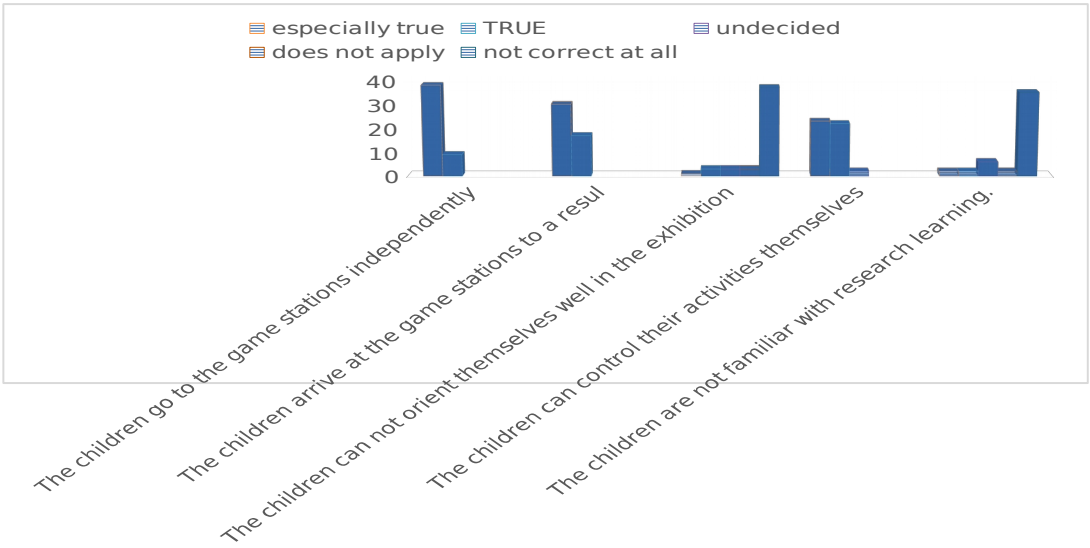


**Chart 3. Children's activities**

Chart 3 gives us information about the number of children which are actively involved in the activities. From that aspect the data shows that 38 respondents or 81% wrote that it is especially true that the children can approach the stations independently, and 19% or 9 teachers wrote that this is true. From the received data it can be concluded that all teachers perceived that the children feel enough confident and desire to approach the stations independently, without adult guidance. From the aspect of the achieved results at the play stations, 30 teachers or 64% responded that it is especially true, and 17 teachers (36%) responded that it is true. According to this it can be seen that all teachers evaluated that the exhibition is positive and think that the children successfully solved the given mathematical challenges.

Regarding the statement: 'The children cannot orient well at the exhibition by themselves', only 1 respondent wrote that it is especially true, 3 teachers- 6 % responded that it is true, same number of teachers responded that it cannot be decided and that it does not apply,

while the majority of teachers (37 or 79%) responded that it is not correct at all, which concludes that the children could orient themselves without problems around the space of the exhibition.

Positively, or 23 teachers (49%) responded that it is especially true, and 47% or 22 teachers responded that it is true to the statement that the children can control the activities by themselves. The teachers have the opinion that the children can finish the activities by themselves with minimal adult guidance.

To the statement that 'The children are not familiar with research learning', the majority of the teachers, or 35 (74%) responded that they do not agree, 2 respondents wrote that it does not apply, 6 respondents (13%) could not decide, while 2 responded that it is true, or especially true. As a conclusion we can state that children had the opportunity to learn different mathematical operations through research.


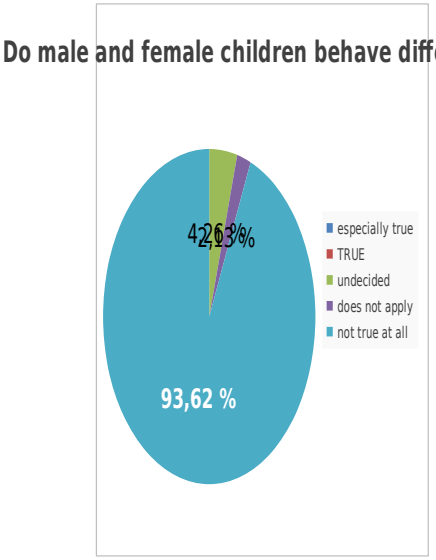


**Chart 4 and 5: Do other children, who do not belong to the target group, act differently?/ Do male and female children act differently?**

The received data from Chart 4 and 5 show that teachers have similar opinions regarding these questions. None of the teachers thinks that children act differently during the activities, 4% think that children act differently, other 4% could not decide, 2% responded that it does not apply, while 94% responded negatively regarding this question.

In the additional section for comments, teachers stated: "All children individually and in groups reach results during the activities."

**COMMUNICATION BETWEEN THE CHILDREN**

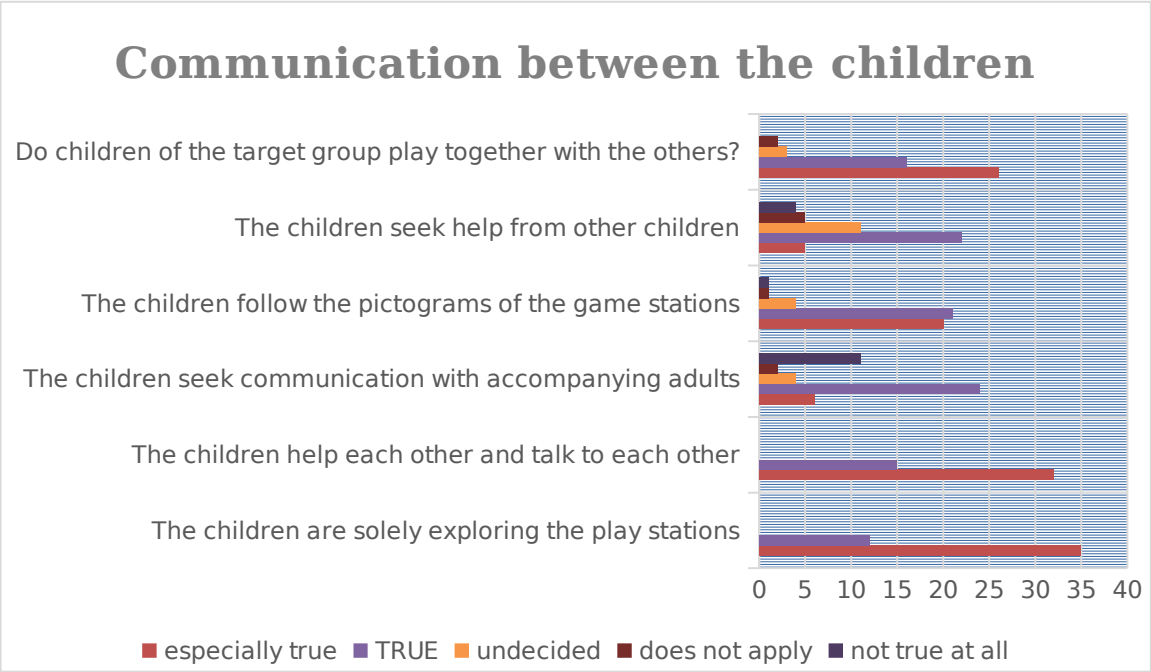


**Chart 6: Communication between the children**

The results shown in the chart 6 give summary of the state regarding the communication between the children during the exhibition, and between the children and the adults who accompany them. From 47 teacher respondents, 35 or 74% wrote especially true regarding the statement that 'the children solely explore the paly stations', while the rest 12 teachers or 26% decided that it is true.

Similar results are received from the analysis of the second statement: 'Children talk to each other and help each other'. 30 teachers (64%) perceived that the children very much communicated between each other and helped each other during the activities, and the rest 36% wrote that this is true. From the received results it can be concluded that the children preferred to seek help from their friends and to solve the difficulties together with them, and very rarely decided to seek help from adults.

However, for the next statement 'Children seek communication with the adults who accompany them', 6 teachers, or 13% responded that this is especially true, and 24 teachers (51%) responded that this is true. 4 of the teachers could not decide, and 2 responded that it does not apply. 11 teachers or 23% responded that the statement is not true at all. This means that half of the respondent think that children needed help from the adults regarding directions for some of the play stations, while 23% think that children could successfully and with no help from the adults solve the given tasks.

Positively, or 43% (20 respondents) responded that it is especially true, and 45 % (21 respondent) responded that it is true regarding the statement that 'Children follow the pictograms from the play stations' and act according the instructions given on the picture. Only 8% could not decide, 2% responded that it does not apply, and other 2% responded that it is not true at all.

Analyzing the results from the next statement (Children seek help from other children), we come to conclusion that the majority of the teachers, or 11% and 47%, think that the statement is especially true and true. The results show that children seek help from other children while playing in a group in order to solve the same task, or the children who have already solved it give instructions to the other children who need help. From the rest teachers, 23% could not decide, 11% or 5 teachers responded that it does not apply, and 4 teachers responded that the children did not seek help from other children and that they individually solved the task.

The majority, or 55% responded 'especially true' and 34% 'true' and from this it can be concluded that the children from the target group (the Roma children) played together with the other children as a team and solved together the mathematical operations. 3 teachers could not decide, 2 responded that it does not apply, and none of the teachers thought that the children from the target group did not want to play with the other children.

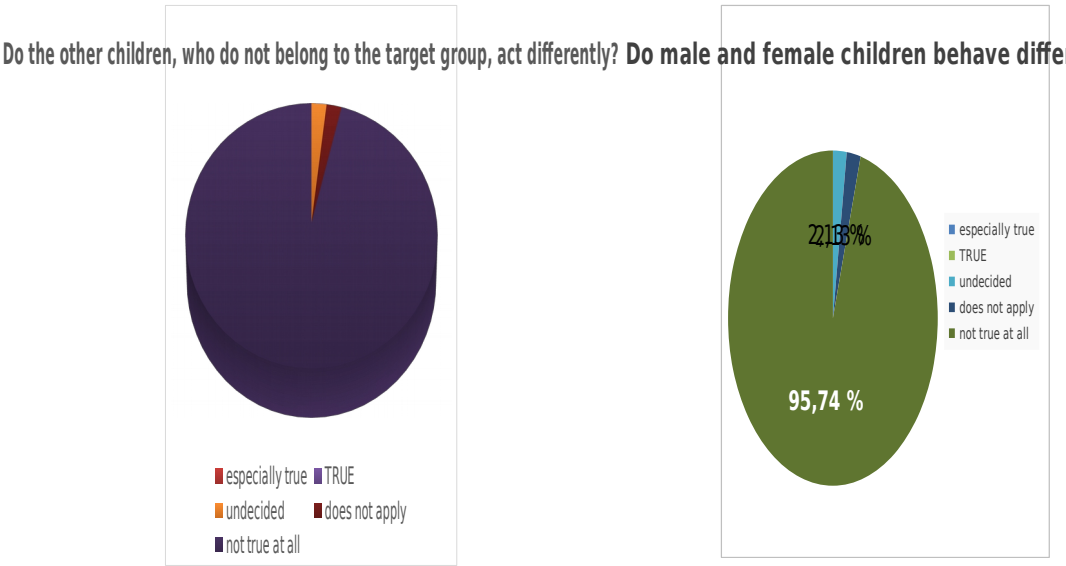


**Chart 7 and 8: Do other children, who do not belong to the target group, behave differently? / Do male and female children behave differently?**

The received data from the chart 7 and 8 show that teachers have similar opinion regarding these questions. None of the teachers thinks that children behave differently during the activities, 2% responded could not decide and the same percent responded that it does not apply, while 96% responded negatively regarding this questions.

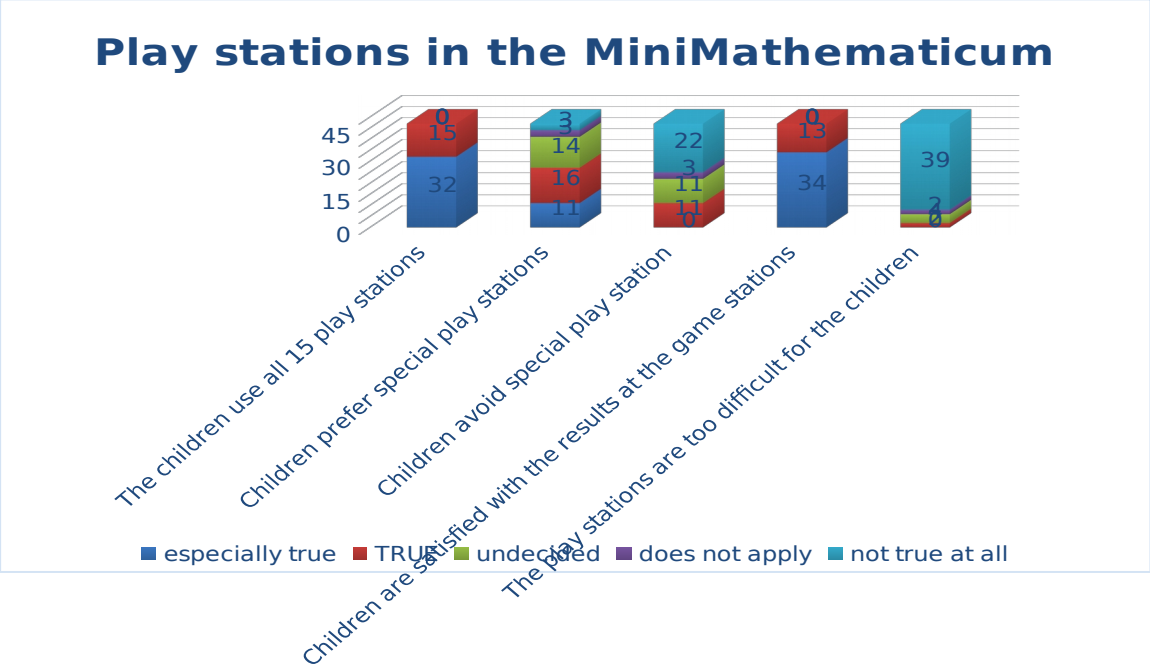


**Chart 9: Play stations in the MiniMathematicum**

Chart 9 gives overview and analisys of the play stations in the MiniMathematicum. All 47 teachers, or 100% think that children had the opportunity to visit all 15 stations in the given 90 minutes. 11 teachers, or 23% responded that children especially prefer some play stations, and 16 teachers (34%) share the same opinion by responding 'true' to the statement. From the rest, 14 teachers, or 30% responded that could not decide, 3 teachers responded that it does not apply, and also 3 teachers responded that the children did not have favorite play stations. To the question: 'Which of the play stations is their favorite?', the majority of the teachers responded that it is the station where children play with soap water, and then follow the station with drawing while looking in the mirror, the pyramid with mirrors and the station with the city of shadows.

While analyzing the statement: 'Children avoid special play station', 23% responded that this is true. From the rest of the teachers, 11 or 23% could not decide, 3 teachers responded that it does not apply, and 22 teachers or 47% responded that children did not avoid special play stations. From this we can conclude that the majority of the children had fun during the activities at each play station. The teachers who decided about the first option, stated that the least favorite play stations were the one where children had to touch objects and match them with the pictures and the association with numbers.

34 teachers responded 'especially true' and 13 'true' to the statement 'Children are satisfied with the results at the play stations'. The received results show that the children felt confident while solving the mathematical tasks and could successfully solve them, while their teachers evaluate their results as excellent. Contrary to this, only 2 teachers think that the play stations are too difficult for the children, while 39 teachers, or 83% think that the play stations were not difficult for the children and the majority of the children could solve the given tasks.

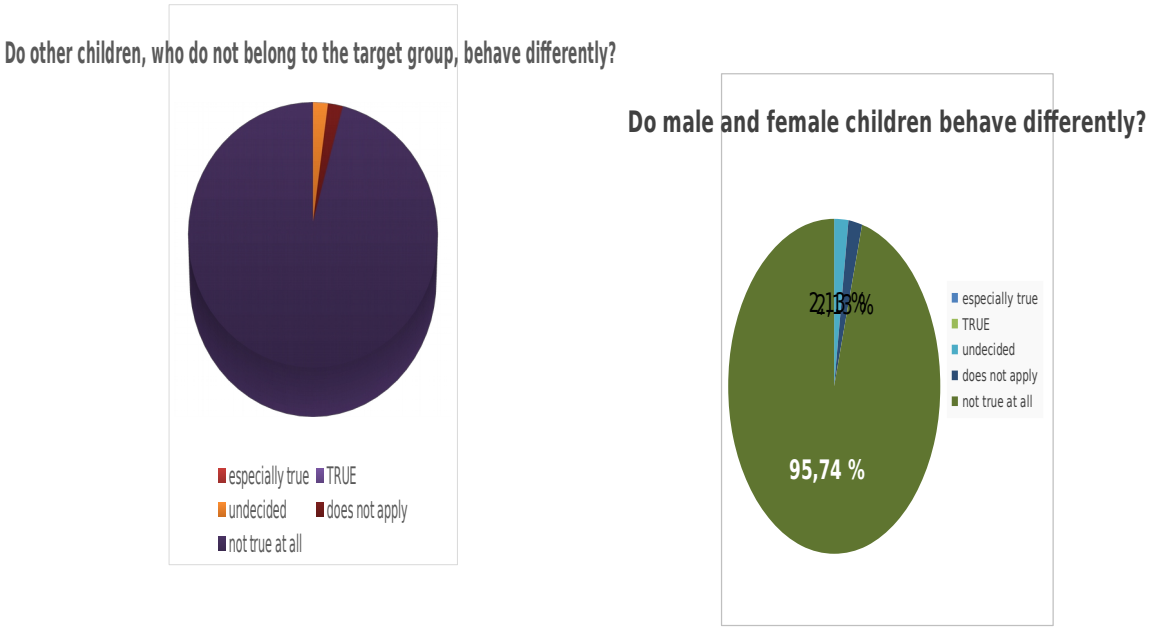


**Chart 10 and 11: Do other children, who do not belong to the target group, behave differently? / Do male and female children behave differently?**

The received data from the chart 10 and 11 show that teachers have similar opinion regarding these questions. None of the teachers thinks that children behave differently during the activities, 2% responded could not decide and the same percent responded that it does not apply, while 96% responded negatively regarding this questions.

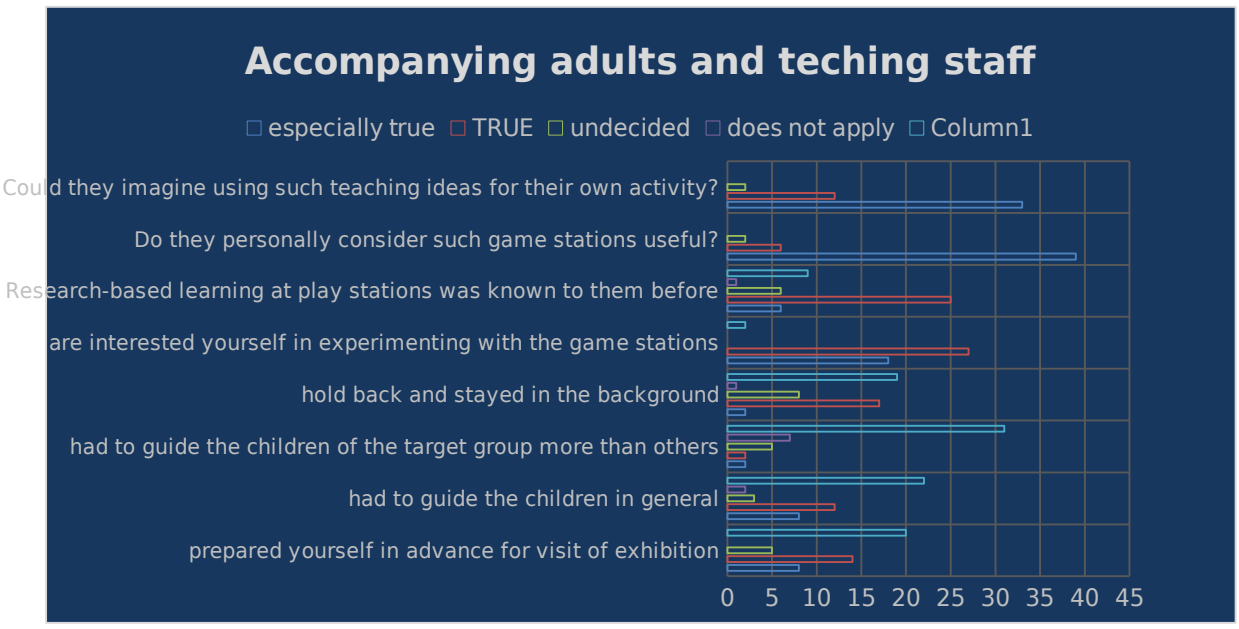


**Chart 12: Accompanying adults and teching staff**

From the received results in chart 12 we can see the opinion of the adults about the play stations. For the first statement we can notice divided opinion among teachers. 8 teachers or 17% wrote 'especially true' and 14 teachers or 30% wrote 'true' to the statement that they prepared in advance for the exhibition. From the rest 25 teachers, 20 stated that they did not prepare in advance (43%), while 5 teachers (11%) did not give a specific opinion. 20 teachers or 43% (17% with 'especially true' and 26% with 'true') responded that they felt the need to guide the children during the exhibition. 3 teachers or 6% could not decide, while the rest 2 teachers responded that it does not apply. The majority of the teachers – 47%, responded that they did not need to guide the children through the play stations and left them to explore by themselves.

A considerably big number of teachers with 'not true at all' (31 teachers-66%) stated that they did not dedicate additional attention and did not guide more the children from the target group in comparison to the other children. 9% of the teachers responded that they guided the children from the target group more than the other children, 7 responded that it did not apply, and 5 could not decide. From the results regarding the fourth statement, we can see that 2 teachers think it is especially true and 36% true about the statement that they were reserved during the exhibition and stood in the background observing. 8 teachers (17%) could not decide, 1 teacher responded that it did not apply, and 19 teachers or 40% did not stand in the background and actively followed the children at each of the play stations.

The majority of the teachers (96%) had interest and desire to experiment themselves and solve the mathematical challenges together with the children, and only 4% responded that this is not true at all.

From the 47 respondents, 6 teachers wrote that it is especially true, and 25 true about the statement that the teachers we already familiar with different methods and techniques for learning through research. The mathematical stations only helped them to expand their horizon and get new ideas for teaching Math so that their students can show better results. 9 teachers or 19% learned about research-based learning for the first time, and 6 teachers could not decide if they had the opportunity to learn about research-based learning.

83% of the teachers responding 'especially true' and 13% with 'true' think that the play stations are useful and helpful for the children in order to learn and understand the Math curriculum and the mathematical operations and forms, as well as for the development of their logics. The teachers have similar opinion about the last statement. 33 teachers wrote 'especially true' and 12 'true' (96% in total) to the statement that the play stations were of great use and helped them to get ideas on how to implement them during teaching in their class. Only 2 teachers or 4% could not decide.

## SUMMARY AND RECOMENDATIONS

Taking in consideration the received results from the observation, the conclusions and recommendations should be directed towards giving educational and strategic support to schools in order to develop interactive curriculum for Math, include innovative methods which will motivate the children to develop their mathematical capabilities and develop their interest for learning Math from their early ages through play and research.

The implementation of the observation as part of the project, gave the opportunity to get a clear picture for several aspects regarding the importance to develop the capacities of children from their early age:

- The children develop their own approach and stile towards learning Math;
- They are motivated to select activities from the offered ones regarding their personal interest and their way of understanding and acceptance;
- Develop the capability to initiate an activity and show bigger persistence in its realization till its finalization;
- They build a personal opinion regarding learning.

The data shows that the method for learning Math through research results as a positive model and children learn a lot of things connected to Math, but also with the everyday life. During the observation, it was concluded that research-based learning of Math in the early grades has positive effects regarding teaching Math in the first cycle of the primary education.

Recommendations:

- Implementing innovative and contemporary techniques and methods in teaching Math with which the children would have the opportunity to learn the mathematical operations individually through research;
- Organizing training for teachers in order to change their opinion towards teaching and learning Math so that they leave the traditional approaches and accept modern style of teaching.

In regards to the behavior, motivation and the success of the Roma children from Bitola, their capability to realize the activities by themselves and the level of positive results at the end of the activities, we could conclude that there is no difference in comparison to the other children.