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## **The Preconceptions of Children at a Preschool Age on the Topic of the Air and the Weather**

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The topic of the air and the weather are themes that children face daily, both in communication with adults and in the media. They perceive verbal formulations which adults often express in connection with the air or the weather, and on the basis of this, they shape their own interpretations of these phenomena. This topic is also anchored within the curriculum of pre-primary education.

In preparing teachers of pre-primary education for certain educational activities, it is first important to identify the child's knowledge of, and experiences with, the given topic. The teacher should know what the children's preconceptions are, in order to be able to follow and tune in to such situations which would awaken in the children a refreshing of their current knowledge and a development of the children's imagination.

In our literature, as well as in foreign literature, we come across several terms, e.g. children's preconceptions, children's naive theories, student's perception of the curriculum, pre-concepts, children's conceptions, children's science, implicit child theories, everyday knowledge, but also error conceptions, wrongful understanding or misconceptions (e.g. Gavóra, 1992; Mareš, Ouhřabka, 2001; Held, 2002; Höfer, Prokšová, 2003). B. Pupalá (2001) states that other terms provide, at the same time, different views of authors regarding the knowledge of a child. In connection to this, he explains that it is due to an objectivistic-methodic approach and an ethno-methodological approach. In the first case, "...the content structures of children's knowledge are confronted with their associated objectified cultural contents", secondly "...prior criteria do not have to be

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present when identifying, analyzing and evaluating 34 structures of the children's knowledge" (Pupala, in Kolláriková, Pupala, 2001, p. 211). A child's preconceptions show the teachers how children understand the world and the happenings within it, where B. Pupala (in Kolláriková, Pupala, 2001, p. 211) talks about "...a scheme of contextually coherent cognitive structures" that "...are relatively stable and subjectively strongly fixed." The author adds that the cause of this is coherence and relative meaningfulness. Sometimes, the child can acquire knowledge sketchily, verbally and at the same time, he also retains his own interpretation of the phenomenon. In such a way, the school (scientific) knowledge that he uses to solve school tasks, can also co-exist with his own (naive) interpretation of the phenomenon, which he uses when solving life situations. B. Pupala (in Kolláriková, Pupala, 2001, p. 212) explains the reasoning and origins of children's preconceptions by abduction – procedure, "...in which a hypothetic rule is searched for in order to explain the case, so that this case would be explained as an application of a rule." In pedagogy, it is about a basis for understanding the children's knowledge. Children's interpretations of phenomena have a cognitive component, including the understanding of the phenomenon and an affective component that includes the relationship towards it and its evaluation (Gavora, 1992; Mareš, Ouhrabka, 2001). J. Mareš with M. Ouhrabka (2001) also add a conative component to these elements. B. Pupala (in Kolláriková, Pupala, 2001, p. 209) raises a question in connection with children's preconceptions "...how to deal with children's knowledge in schooling, i.e. how various teaching situations (or conceptions) participate in influencing the children's outlook on the world." He sees the solution to be the anchoring of a theme of teaching by a context that relates to the children's preconceptions. It depends on the interpretation of the child's experience, on the content and the semantic structure of a preconception and its reflection by a child, "...by the confrontation of scientific representation with an individual variant of conceptualisation of some phenomenon when "reading" particular concepts" (Pupala, in Kolláriková, Pupala, 2001, p. 214). Topic mediation, as well as the interpretative reaction to it, requires reflection through speech, with which its social and

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cultural context is underlined in the knowledge process (Pupala, in Kolářiková, Pupala, 2001).

In the paper, we have devoted scope to the detection, analysis, interpretation and development of children's preconceptions on the topic of the air and the weather.

### **Finding out children's preconceptions on the topic of the air and the weather**

Our aim was to identify and describe the preconceptions children at a preschool age have on the topic of the air and the weather and to propose options for their development. From such a formulated objective, the following tasks emerged:

- to devise a research tool focused on studying the preconceptions children have on the topic of the air and the weather (Table 1),
- to determine a research sample and implement an entrance interview,
- to propose a development program for pre-primary education (elaborated in a separate publication),
- to implement a proposed developmental program in pre-primary education,
- to implement an exit interview,
- to formulate recommendations for pedagogical practices.

We used a structured **interview** to find out the children's preconceptions. P. Gavora (2010) explains that the research interview is a planned scientific method, in which the researcher asks the respondent questions, and his answers are recorded. The external manifestations of the respondent can also be seen during the interview and then, according to this, the rest of the interview may be guided.

Similarly, A. Wiegerová (2011), refers to the diagnostic interview as an appropriate method for detecting the initial impression of a given

phenomenon. She explains the differences between unstructured, structured and semi-structured interviews, while recommending a semi-structured interview as the most appropriate in science education, in which there is the possibility for the “free addition” of clearly formulated questions, according to the situation, which may occur in the interview with the child.

We conducted the entrance interview individually. We asked each child the same questions, and we created a peaceful, credible atmosphere. The children had the opportunity to not answer the questions or to answer, “I do not know”. We explained to them that they could say what they wanted, and that we would talk together about everything later on. Here are the questions, together with the expected correct answers, depending on how we explain selected aspects of the topic of the air and the weather to the children, during the implementation of the proposed developmental program.

**Table 1. Structured interview – the expected correct answers**

| STRUCTURED INTERVIEW (entrance - exit)<br>Questions with possible correct answers  |  |
|--|--|
| 1. Have you heard the word air before? What do you think it means?                 | It is all around us; it is a mass; it is a gaseous substance; we call it the atmosphere; it can be hot and cold; warm air is lighter than cold air, it rises up.   |
| 2. Can we see, hear, smell or feel the air?  | It is invisible; it may have a smell and taste depending on where it is, for example smoky air, the air above a flowery meadow, etc.; we can hear it in the form of wind and drafts; we can hear it while cycling, while running; it can be calm like water in a glass; we can see the movement of the air on the bending branches of trees, on the leaves, on laundry hanging up to dry, on hair blowing in the wind, on the clouds; we can feel it while running or cycling; we can prove the presence of air through drafts, and blowing through a straw into a glass of water. |
| 3. Can the air have pressure? What does it mean?                                   | Air pressure is the force applied within the air (in the atmosphere).  |
| 4. What is the wind? What do you know about the wind, does it have speed or power? | It is the motion of air masses. We distinguish between calm, a breeze, a light wind, a strong wind, a whirlwind.   |
| 5. What can we see in the sky during the day, except for the Sun?                  | Clouds.  |

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| <p><b>6. Are the clouds always the same?</b><br/>No; they change shape and colour, they can be white, grey, dark grey; we know different types of clouds: low, medium, high.</p>  |
| <p><b>7. Where do the clouds come from?</b><br/>Water vapour rises from the water, at a high altitude in the cold air it changes into small droplets, to ice crystals, which bind together and form clouds.</p>   |
| <p><b>8. Are clouds necessary?</b><br/>Yes, water is essential for life in nature.</p>  |
| <p><b>9. What is fog?</b><br/>The same as a cloud, but it is close to the ground; during fog, visibility is poor.</p>   |
| <p><b>10. What is a storm?</b><br/>Rain, which lasts for a shorter time and finishes fairly quickly; heavy rain, where a lot of water falls down in a short time and clouds are rapidly moving; during a storm lightning can also be seen and thunder can be heard.</p>   |
| <p><b>11. Why is there lightning and thunder?</b><br/>Water droplets and ice crystals in the cloud are moving; they crash into each other and charge with electricity. When the charged clouds come closer together (with opposite charges), a spark jumps between them (accompanied by lightning effects and a high temperature), hence the flash. Lightning, during a storm, rapidly heats the air that it passes; this suddenly increases its volume. The sudden movement of air produces thunder.</p> |
| <p><b>12. What is dew?</b><br/>These are small water droplets, which appear on the surface of objects in the morning or in the evening (the hotter the air, the more water vapour will be maintained, when it cools down, part of the water vapour is precipitated and converted into droplets of water).</p>   |
| <p><b>13. What is hard rime?</b><br/>Frozen dew.</p>  |
| <p><b>14. What is a rainbow?</b><br/>The colours in the sky during simultaneous sunlight and rainy weather: red, orange, yellow, green, blue, blue-violet (indigo), purple.</p>   |
| <p><b>15. Where does rain come from?</b><br/>From the clouds.</p>   |
| <p><b>16. Where does snow come from?</b><br/>From the clouds.</p>   |
| <p><b>17. What is the weather?</b><br/>The changes that are happening, which we observe in nature, we perceive within the air - warm, cold, wind, rain, snow, a lot of clouds, a sunny day. . .</p>   |
| <p><b>18. What weather do you like the most and why?</b><br/>Subjective responses by the children, associated with the weather.</p>   |

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NB: The information that is difficult to understand is given in brackets, which is more for use by the teacher than by the children.

The teacher asked the children the aforementioned 18 questions, while some questions also included supplementary questions. Not all of the children's answers in the interview fell within the prescribed structure (Table 1), therefore, other responses were evaluated individually and in the context of the whole interview.

A complementary method during the implementation of the developmental program was the analysis of the children's work, namely an **analysis of the children's drawings**. This method is used mainly in pre-primary education, because children at a preschool age cannot read and write. A. Wiegerová (2011) states that an explanation of the children's drawings is necessary to supplement with a discussion about the drawing.

In our survey, we were not diagnosing children through their drawings. They were only a survey of the children's preconceptions, about the addition and clarification of the data obtained using the interview.

We elicited preconceptions from twenty 5–6 year-old children attending kindergarten. The children were from two classes in a selected kindergarten, which was willing to join the project. The teacher carried out the proposed project simultaneously in both classes. For the reasons of the anonymity of the children, we do not provide the name of the kindergarten in which the survey was carried out.

### **An analysis and interpretation of children's preconceptions on the topic of the air and the weather**

We analysed the children's answers to the individual questions, both at the entry and exit interviews. We present a brief analysis of the children's responses.

The children listened attentively to the questions, were interested in answering and cooperated with the teacher, but some had difficulty in answering them. They looked unsure mainly in the first questions, while

the supplementary questions and the encouragement of the teachers that it was not a problem if they did not answer the question helped them. Sometimes, the children were concise with their answer, but if they had experience with the content of the questions, they also expressed their experiences. To some questions, a one-word answer was enough, or an affirmative or negative answer.

When asked the first question in the entrance interview, **have you heard of the word air and what do you think it means**, half of the respondents could not answer it. Some children associated the air with the wind, some with breathing ("It's good for people, because they can breathe") and one child said, "It is steam". From the children's answers, we can see that no-one had explained to them the meaning of the term air and thus, even if they had a spontaneous idea of what the term means, they could not define it, they could only put it in the context of other phenomena.

On the second question of whether **we can see, hear, smell or feel the air**, only one child could not answer. The majority of the surveyed children claimed that we could not see the air. The majority of the children that had heard of the term air associated it with the wind, only two said that *we cannot hear the air*, some said that *we can feel the air*, others said that we cannot feel it, but none of the children indicated that we can smell the air. In contrast to the answers to the first question, the children were able to clearly answer and express their sensory feelings associated with air.

In the third question, relating to air pressure, **can air have pressure, what does it mean, is air pressure necessary**, in the entry interview only two children responded to such an effect that air pressure is a lot of air, and it is very strong air. The others could not express themselves at all. Air pressure is a complex topic, and hence, we did not expect a definition of that term from the children. We were interested in what they imagined under that term, or whether they had heard it mentioned somewhere before. Out of curiosity, we can indicate how one child associated the term air pressure with the term blood pressure: *"You put it on your arm at the doctors and it is being measured"*.

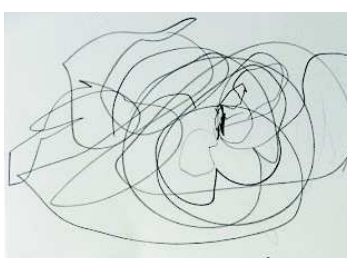
In addition to answering the questions in the interview, the children drew their ideas on the topic of air. In Figures 1–3, drawings of the children's preconceptions about air are shown.

In the aforementioned drawings, it can be clearly seen that before the implementation of the proposed developmental program, the children had only a general idea about the air. The drawings are very similar. The children filled an A5 sheet of paper with lines; the difference was in the colour of the lines (light blue, dark blue, grey, black, green), in the pressure that the kids used to draw the lines with the drawing materials (crayons), in the direction of the drawn lines, and in their number. Alternatively, in some drawings, there was a hint of clouds.

**Figure 1**  
**Drawing of the air I**



**Figure 2**  
**Drawing of the air II**



**Figure 3**  
**Drawing of the air III**



When asked **what is the wind?**, a third of the children were completely unable to comment on the question, almost half of the children knew that the wind blows ("It's blowing the air that moves around the globe"), they used the terms weak, strong, tough, and two children said that the wind does not always blow, and that sometimes it is calm.

**Figure 4**  
**Drawing of the wind I**



**Figure 5**  
**Drawing of the wind II**



**Figure 6**  
**Drawing of the wind III**





The drawings of the wind (Fig. 4–6) looked noticeably like the drawings of the air. In an artistic representation of the wind, the children mostly used “doodling”, thus drew it like flowing air. In one of the drawings, leaves floating in the wind appeared (Fig. 6).

When asked **what can be seen during the day in the sky, except for the Sun?**, almost all of the children responded that there are clouds (*oblaky*), while one child extended the obligatory response of *clouds*, by using the term *white clouds* and one child used another term for clouds (*mraky*). One of the children defined clouds as follows: “Well, they are something like fur, but they are a bit airy and we could get to them. If we would fly up by a rocket and break them, there would be a hole there.”

When asked **whether clouds are always the same**, only one child in the entrance interview could not answer, while the others answered correctly that they can be different, e.g.: “Bigger, smaller, they always move.” “Sometimes totally black, sometimes white, due to the storm and some are pushed aside by the Sun.” “Sometimes they remind us of the Moon, they have the shape of a star, a doggy, a horse.”

On the following question, **where do clouds come from?**, one correct answer was heard, and only one child used the word steam. Others could not answer, or responded incorrectly (“They give the wind”).

**Are clouds necessary?** – that was the sixth question in the entrance interview, to which only two children knew the correct answer (“Yes, for plants and trees, they must drink, it rains from the clouds”; “Yes, in order for flowers to grow and also fruits and vegetables”). The other children either did not respond at all or indicated that clouds are not necessary (“No, they are not necessary, because then there is a storm, and neither the sky nor the Sun can be seen”).

From the answers to the seventh question, **what is fog?**, it was shown that the children had experience with fog, albeit only half of the answers could be considered to be correct, e.g.: “The same as clouds”, “You cannot see through fog”, “It is such a thing that we can see, but we cannot see the things that we want to see. It appears, when there is a lot of air.”

Lightning, thunder and rain are terms that often appeared in the answers to the question **what is a storm?** E.g.: “Lightning and a huge rainfall can start.” “That there is lightning, thunder and it is raining.”

The question, ***why is there thunder and lightning?***, was more difficult for the children. The children did not know the correct answer and in the answers, such statements were heard as *clouds collide; that the lightning is from a heavy downpour; thunder is lightning; warm air comes into collision with cold air; Little Jesus sends down the lightning*, and so on.

***What is dew?*** - that was the twelfth question, and in the entrance interview, more than half of the children could not answer it, and only one child explained it properly: they are the *drops* on plants, and one third of the children answered the question in relation to water, rain (*"That the grass is wet"*). Some children thus thought that dewdrops are caused by rain, for example: *"It is rain that fell to the forest on some flower or plant, or even into the garden."*

At the entrance interview, not even one child knew the answer to the question, ***what is hard rime?***, or attempted to explain this term in their own words.

When asked ***what is a rainbow?***, one child imagined candies. Although the others knew what a rainbow is, only two of them knew how it appears (*"Once, when I was in the garden, I saw how it rains and the sun is shining at the same time"*). Not even one child could properly name the colour spectrum in the entry interview (*"A colourful thing that looks like a hill, red, brown, pink, blue, purple, and sometimes white"*).

The question of where does rain and snow come from was easy for the children, they said from the clouds or from heaven. (*"Raindrops are up in space and those drops fall into the clouds and from the clouds they fall to the ground."*)

The penultimate question was directed towards the children's pre-conceptions about the weather. When asked ***what the weather is***, a third of the children in the entry interview could not answer. The children responded, for example: the weather is when it *rains, snows* or *the sun is shining* or *snow, storm* and *rain*. Only two children tried to define the concept of the weather:

*"The weather is when Mother Nature gives us some weather, whether it is warm or cold. Seasons are when the globe rotates to spring, summer, autumn, winter, and into the Ice Age."*

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*"In order to show how nature is changing, whether it is happy or sad."*

On the last question, **what kind of weather do you like the most and why?**, two children did not answer in the entry interview. Almost all of the children used words associated with the Sun in the last answer (*"In order not to rain, I prefer the summer, so that it is not snowing."*).

On the basis of the survey and the description of the preconceptions of the children, it can be said that the teacher had real details about the children's knowledge of the weather for the upcoming topic, through the proposed development program. The children had only a minimal knowledge of what the air is, or could not create their own definition of this term. The answers to the second question, related to the air (whether we can see, hear, smell or feel), told us that the children knew very little about the air. The same could be said about the question about air pressure. When asked about the wind, we found out that the children had a problem describing the wind. According to the children's responses to the questions about the clouds, we deduced that, although the children could easily distinguish them, they had only a slight knowledge about them. They were able to characterise a storm, but even in this area they had some reservations. It was a surprise that not one of the children knew what hard rime was and only some children knew what dew was. Not even half of the children gave a correct answer to the question about rainbows. All but one were aware of this natural phenomenon, but their knowledge, as shown by the entry interview, was very superficial and inadequate. It was similar with the question about where rain and snow come from. We were surprised that several children could not answer the question about the weather and that they had a problem explaining this abstract term. In contrast, when answering the last question, they responded that they like sunny weather the most, so it was clear that despite that, this term is not unknown and they can spontaneously use it and understand it during a conversation.

On the basis of the results of the entry interview, we designed a developmental program which includes various investigative activities designed to explain the concept of air and all of the natural phenomena associated with the weather.

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### **Developing children's preconceptions on the topic of the air and the weather**

Every fact that the child finds through their own activity is a great discovery for him, so it is necessary to give him as much incentive as possible for exploring, testing and searching for answers (Kopáčová 1997, 2009). Therefore, within the proposed development program, investigative activities are implemented, e.g. handling, demonstration, discovering and experimentation, but also art, music or drama activities.

We orientated ourselves within the available specialist literature with a natural science focus (Bennett, Smith, 2003; Bézuelová, 2003; Bohuněk, Kolářová, Janovič, 2000; Hammond, 2007; Lorbeer, Nelsonová, 1998; Melicherčíková, Melicherčík, Rochovská, 2012; Schmidt, 1972; Vosátka 1968; Weiss, 1996), in order to obtain topics for investigative activities, as well as scientific information about phenomena related to the theme of the air and the weather. Through the Internet, we acquired engaging and current pictorial material for children, to go with individual investigative activities.

Prior to the realisation of the project, during its preparatory stage, we investigated children's preconceptions about the air and the weather. We focused on obtaining a picture of the knowledge and experiences of children on the topic of air and the natural phenomena associated with the weather – clouds, rain, snow, wind, hail, fog, dew, hard rime, rainbows and storms. Based on the findings, we planned investigative activities focused on an understanding of these natural phenomena, but we also planned many supporting activities with an artistic, musical, motion or drama focus, based on the experiential learning of children. Primarily through artistic activities, during the implementation of the project, we wanted to acquire a picture of how children understand the individual activities, what is their favourite, etc. The drawings by the children were carried out with crayons on A5 paper, so that they could comment on the topic in the easiest possible way and in a comparatively short time.

The aim of the project was to develop children's preconceptions about the air and the weather, so that through the completed investiga-

tive activities they could gain a more realistic and more specific understanding of the natural phenomena associated with the air and the weather, and also develop vocabulary related to this subject.

Altogether, 13 research activities were designed and implemented and two concluding summarising activities related to the air and the weather, with all activities having the same structure. The main objective of this activity is broken down into partial objectives, subsequently implemented in organisational forms, didactic methods, material didactic resources and sources of literature, which were the inspiration for the processing of the activities. We have described in more detail the progress of the activities and a reflection from their verification in the kindergarten. Also important for the teacher is the specialised information associated with the topic activity, which can be particularly useful in the event of unexpected questions from the children. The presented scientific information is, however, necessary in order to present them in an appropriate form, in order for the children to be able to understand the explained natural phenomena and secondly so that the teacher does not give the children scientifically unacceptable information. It is an extremely challenging task which requires pedagogical mastery from the teacher, especially in terms of responsibility and creativity.

We present an illustration of one of the activities, the intention of which was to introduce children to the formation of a rainbow.

### **Exploring activity – Rainbow**

**Objective of the Activity:** to describe the formation of a rainbow in one's own words.

**Partial objectives:** Describe the conditions for the creation of a rainbow. Name the colours of the rainbow. Propose a method for the artistic portrayal of a rainbow and implement it.

**Organisational form:** frontal, individual.

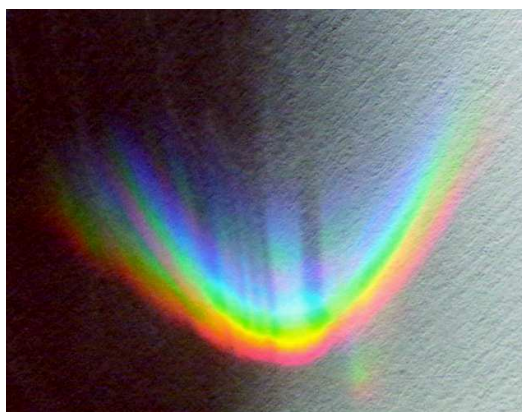
**Didactic methods:** controlled discussion in a large group, drawing, brainstorming.

**The material didactic resources:** photographic material, visual aids (drawings, colouring pencils, brushes, tempera paints...).

***The course of the activity:***

The teacher induced the topic of the rainbow through the question of whether it is possible for it to rain at the same time as the sun is shining. This was followed with a demonstration of a rainbow by the means of a glass of water, white paper and the use of sunlight. The glass was placed on the paper, so that sunlight could pass through it, while the greater part of the paper was in the shade. The sun's rays, passing through the glass of water, were split into the seven colours of the spectrum, and a rainbow was created on the paper (Fig. 7).

**Figure 7**  
**Demonstration of a rainbow**



Furthermore, the children, in conversation with the teacher, focused on the colours of the rainbow. They recited them first on the basis of observations from the demonstration, and later on the basis of the pictorial material which the teacher had prepared for them.

During further activity, they worked with coloured strips of textiles which had the colours of the rainbow. They could spontaneously figure out, with the help of these coloured strips of textiles, how to create a rainbow. Then they created a rainbow through drawing, painting and the gluing of raindrops (Figs. 8, 9).

**Figure 8**  
**The resulting product – Rainbow I**



**Figure 9**  
**The resulting product – Rainbow II**



***Specialised information for teachers, associated with the given activity:***

A rainbow is an exceptional meteorological and optical phenomenon. We can watch it on a raindrop lit by the sun's rays, at an angle of  $41.5^{\circ}$ – $42.5^{\circ}$ . Under suitable conditions, it might result in a drop of water having two reflections, and thus also an ancillary rainbow, which is of a weaker intensity, and can be observed at an angle of  $50.1^{\circ}$ – $51.9^{\circ}$ , while it is over the main rainbow and the colours within it are in reverse order (red is in the inside of the curve).

Sunlight, which most commonly appears as white, is in fact composed of several colours - red, orange, yellow, green, blue, blue-violet and purple, which correspond to different wavelengths (Table 2). At the interface of the two environments, the light reflects and refracts into a new environment. The angle of refraction for each wavelength is different. When a light beam penetrates into a raindrop, white sunlight is spread over the entire visible spectrum.

The circular shape of the rainbow has nothing to do with the shape of the Earth or the shape of the Sun. A rainbow has the form of a circular arc because a drop of water has a spherical shape. Rays of light fall on a drop not only in one plane, but in all planes, therefore, we see a rainbow as an arc around an axis, where the observer is directed by a shadow cast

by the Sun. Therefore, from mountains or from an aeroplane, a rainbow is observed as a closed circle.

**Table 2. The wavelengths of light of the various colours**

| Colour | Wavelength $\lambda$ [nm] |
|--------|---------------------------|
| red    | 780 – 630                 |
| orange | 630 – 590                 |
| yellow | 590 – 550                 |
| green  | 550 – 480                 |
| blue   | 480 – 450                 |
| violet | 450 – 420                 |
| purple | 420 – 380                 |

(Source: Melicherčíková, Melicherčík, Rochovská, 2012, p. 28)

***Reflection on the activity:***

The children did not have a problem responding correctly to the initial question from the teacher. They were only wrong when reciting the colours. However, after carrying out activities (a demonstration of the rainbow, games with coloured textiles and art activities), they were able to recite the colours of the rainbow. When evaluating their work, some of the children saw that they had drawn the colour spectrum in the reverse order. The teacher responded to the situation with an explanation that a rainbow could also be formed in reverse (Fig. 9). However, the goal of the activities was not to recite the colours of the rainbow in the correct order, it was only about being aware of what colours make up a rainbow.

In the exit interview, in response to the question of what is a rainbow, the children recited almost all of the colours, although they made mistakes concerning the order of the colour spectrum. The biggest problem for them was caused by the colour indigo. The correct answer to what causes a rainbow to occur was indicated by almost half of the children.



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**Sources of literature for processing the activities:** Hammond, 2007; Gahér, 2003; Melicherčíková, Melicherčík, Rochovská, 2012, p. 28.

## Conclusion

Natural phenomena fascinate children beginning from the earliest ages. Here, it is possible to stress the role of the educator, so that at every stage of education he will be able to bring children closer to seemingly complicated natural phenomena and actions in an appropriate manner, with a search for optimal methods, so that every child's soul is satisfied, which is naturally a curious soul that lacks explanations about the happenings of this unique world and the life within it. To move the cognitive level of children in the desired direction is one of the necessary duties of educators.

When verifying a proposed developmental program focused on developing children's preconceptions about the air and the weather, it was confirmed that children had actually developed their preconceptions, which was evidenced by their answers in the exit interview. It was also noticeable that their vocabulary related to the given issue had been enriched under the influence of this developmental program.

It is very gratifying for us that the realisation of the proposed developmental program is not our final step for the introduction of innovative, progressive methods and formats in the educational-upbringing process. We have come to the conclusion that it is necessary to continue on this path, that during investigative activities children feel like fish in water, it is completely natural for them to develop their thinking, to reason, and to broaden and deepen their knowledge. Last but not least, we must not forget that the aim of a pre-primary education is the personal and social development of the child, with an emphasis on personal experiences and playful activities with a positive approach to the child. According to O. Račková (2007), if there is any dispute about this central area of the development potential of personality, it can block, repress, call into question and traumatise their personal development and determine the trajectory of the school curriculum and children's success for a long-time.

All of the designated attributes have their place, especially in the proposed developmental program which we have presented in the publication, *Scientists in Nursery School* (Rochovská, Krupová, 2015), and we believe that it will be happily used in kindergartens.

**Figure 10**  
**The publication *Scientists in Nursery School***



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### **Abstract**

This paper is focused on the preconceptions of children at a preschool age on the topic of the air and the weather. The aim of the paper is to identify and describe the given preconceptions, to further analyse and interpret them and, on the basis of this, to propose investigative activities which would develop these preconceptions of the children. A structured interview was used as the method to find out the preconceptions among the children.

**Key words:** preconception, pre-primary education, children at a preschool age, the air and the weather.

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