Does Air Exist in Vases?
Mental Representations of Children 4–6 Years Old

Чи існує повітря у вазах?
Ментальні уявлення дітей 4–6 років

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ABSTRACT

Introduction. One of the prominent domains of research in the context of Early Childhood Science Education is the study of mental representations of 3–8 years old children about phenomena and concepts of science, as they are formed in school knowledge. Along this line, research has been conducted on various fields. Among them a small number of studies has turned to the concept of air. Basic mental representations of air indicate that young children do not recognize it as a material entity and are strongly influenced in their predictions by factors related to elements of experimental situations.

Goal. The current research aims to explore the mental representations of 4–6 year old children about the existence of air in vases.

Methods of the Research. The study was qualitative in nature and the sample was 41 children aged 4–6 years (26 children 4–5 years and 15 children 5–6 years). The research was conducted using semi-directed individual interviews. Children were asked, through 6 diverse tasks, to express their view regarding the existence of air in closed and open vases that were located in ‘closed’ or ‘open rooms’ as well as in the outdoor environment. Discussions were based on 6 digital pictures depicted in the tasks.

The Results. Our findings showed that rather few responses were consistent with school knowledge. Among them, the fewest sufficient answers were in the tasks that dealt with closed vases. While the differences in responses between closed and open vases were not statistically significant, they were nevertheless systematically recorded. In addition, quite interestingly a substantial number of children regarded open window as an important factor in the existence of air in the vases. In general, children’s answers were dominated by pre-logical explanations, instability in responses among different tasks as well as centrations regarding different parts of the pictures.

Conclusions. In the current study became evident that the identification of children’s difficulties regarding the existence of air in closed vases allows a series of rational choices at multiple levels: in the design of teaching activities, in the formulation of curricula, in the development of educational material and in teacher training. The need to extend the research to other areas related to the conceptualization of air was also highlighted.

Key words: air, mental representations, early childhood.

Introduction

The development of the study of early childhood education has gradually led to a multifaceted approach to learning issues. An important dimension of this orientation is to base pedagogical innovations on research data. Among these, the issue of early approach to the natural world and the initiation of children aged 3–8 years into the phenomena and concepts that are thoroughly examined in science at higher
education grades emerged as an important field of research. Along this framework, research with multiple orientations and dimensions is carried out with an aim to cover diverse thematic areas such as the difficulties of young children’s thinking (Christidou & Hatzinikita, 2006; Convertini, 2021; Ioannou et al., 2023; López-Banet et al., 2022; Vidal Carulla & Adbo, 2020), the basic studies and continuing education of teachers (Corni et al., 2019; Draganoudi et al., 2023) the curricula and appropriate educational materials as well as the use of digital technologies (Kalogiannakis & Papadakis, 2019; Kalogiannakis et al., 2018), the non-formal education institutions (Kornelaki & Plakitsi, 2018; Parissi et al., 2019; Salvatierra & Cabello, 2022), the exploration of science education in the wilderness of special education spectrum (Kaliampous, 2021; Katsidima et al., 2023), etc. The set of these dimensions has gradually synthesized a particular scientific field that is internationally recognized as Early Childhood Science Education (Akerson, 2019; Flores-Camacho et al., 2023; Ravanis, 2022; Siry et al., 2023).

Theoretical Framework

For more than fifty years the issue of representations of the natural world in the thought of children of all ages has been extensively studied and is possibly the most essential field of research within Science Education. But what are mental representations? They are entities that the child begins to construct in his/her mind from birth as he/she lives and develops in the social and physical environment. In everyday life, the child formulates and reformulates a certain number of reasonings, solves relevant problems and gradually forms the phenomena and concepts studied in the natural sciences through the construction of representations (Jelinek, 2020; Ravanis, 1998; Samara & Kotsis, 2023). A prominent research area within this field is the study of children’s mental representations of the natural phenomena and specifically the reasoning that is formulated based on these representations and their possible distance from school knowledge as it is constituted, at the qualitative level, in curricula. Indeed, the detection of children's representations on a wide range of subjects allows the identification of the difficulties and obstacles that need to be addressed in order
to form new patterns of thought compatible with school knowledge (Fratiwi et al., 2020; Kokologiannaki & Ravanis, 2013; Maskur et al., 2019). Along this line, the aim of the present study is to investigate the mental representations of 4–6-year-old children on the existence of air in both closed and open vases.

The conceptualization of air as a physical entity has been well studied for students aged 12–18 years (Bektiarso et al., 2023; Karaduman et al., 2021). The central theme is always the relationship between macroscopic and microscopic properties of air as well as the processes of modelling them. A very limited number of studies have been carried out on the way air is perceived by early childhood children. Here, of course, the approach should be different, since young children often do not experience air as a physical entity at all. A number of studies have consistently found that children aged 4–8 years face difficulty in conceptualizing air as something material and discrete. Borghi et al. (1998) and Kornelaki (2023) found some pre-logical forms of thinking in children's reasoning about air. In addition, Van Hook et al. (2005), Lorenzo Flores et al. (2018) and Sesto Varela et al. (2022) found difficulties both in detecting air in space and in conceptualizing its material nature, while Kontili et al. (2023) found that air is more easily detected outdoors, while indoors is associated with the existence of openings to the outdoors such as windows. Other studies (Liang, 2011; Rochovská, 2015) have identified specific difficulties in understanding air properties such as weight or motion. Despite the difficulties that were highlighted above, attempts to carry out teaching activities with different teaching techniques such as Predict-Observe-Explain activities (Lorenzo Flores et al., 2018; Sesto Varela et al., 2022), as well as attempts to create cognitive conflicts (Liang, 2011) and modelling activities (Van Hook et al., 2005), has led to the finding that children are able to gradually overcome at least some of their difficulties.

However, in the literature review we did not come across surveys that deal with the presence of air in specific conditions such as in open and closed vases. This topic is of particular research interest as it can provide a strong indication of a comprehensive conceptualization of air dispersion. That is exactly why we chose this topic of study.

The current research aims to explore the mental representations of 4–6 year old children about the existence of air in vases.
Particularly, in the current study we tried to answer the research question of whether children aged 4–6 years are able to identify the existence of air inside vases.

**Methods**

**Participants**

41 students of a kindergarten in Patras (Greece) participated in the study; 15 of these students were 5–6 years old and 26 were 4–5 years old. The sample was convenient, and all the children participated on a voluntary basis. The research was conducted with the permission of the Department of Educational Sciences and Early Childhood Education of the University of Patras while written consent were acquired from all the participants’ parents. No air-related activities had been carried out in the classroom of these children. None of the children had come across in his/her classroom to any kind of air-related activities.

**Data Collection**

Data collection was done by semi-directed individual interviews. The interviews were conducted in a specially designed area of the school and lasted approximately 10 minutes. Each child was asked to respond to 6 tasks which were part of a larger interview on air comprehension. These tasks were designed to study the way children conceptualize the presence of air in closed or open vases which are placed in diverse environments. Along this line, children were presented with 6 digital images, one for each task, which showed a glass vase in 3 different environments (open classroom, closed classroom and schoolyard) and in 2 different situations for the vase (Task 1: closed vase – closed room, Task 2: open vase – closed room, Task 3: closed vase – open room, Task 4: open vase – open room1, Task 5: closed vase – outdoor, Task 6: open vase – outdoor).

**Analysis of Data**

The research was qualitative in nature while content analysis was used to deal with the data. This analysis was based on the transcript material along with specific field notes that were kept by the researchers during the interviews. The categories of analysis of student responses
were based on the distance among the mental representations of children regarding the presence of air and the macroscopic model of school knowledge that identifies air everywhere as an entity extending and occupying all space, without any physical limitation. The starting point of the analysis was the distance of the children’s responses to the representations of the presence of air from the macroscopic model of school knowledge that identifies air everywhere as an entity extending and occupying all space, without any physical limitation. In general, the representations were classified into three distinct categories:

1. At the first level were classified those responses that were compatible with school knowledge. These responses, labelled as sufficient, acknowledged the existence of air in the vases without restrictions related to other factors.

2. At the second level were classified the intermediate responses that while consistent with school knowledge they took into account the conditions of the environment were the vases were placed.
At the third level were classified the insufficient responses in which the existence of air was not recognized at all.

**Results**

In what follows the results for all six tasks are presented in a consistent way. In particular, firstly the categories of children’s responses are shown along with typical examples of discussion with the researcher. Later, tables of frequency of responses for each task are given.

**Task 1. Is there air inside the closed vase that is placed inside this ‘closed’ space?** (Figure 1).

In Task 1, children’s responses were classified into three distinct categories.

**Sufficient responses.** Here were classified those responses were the existence of air in the vase was recognized. For example, Student 30: “There... if you open the vase though and drop it on the table it might fall down and break so all the air might escape”.

**Intermediate responses.** Here were classified those responses were the presence or absence of air in the vase was attributed to external factors such as the distance of it from the window. For example,

Researcher: In which place should the vase be located in the room in order to have air in it?
S22: Here (points next to the flowers)
R: If I put the vase on the carpet would there be air in it?
S22: No.
R: Why do you think that?
S22: Because it’s far away from the window.

**Insufficient responses.** Here were classified those responses that did not recognize the existence of air in the closed vase unless it is opened and sometimes only in the case it is opened at specific points in the room. For example,

R: This picture depicts a closed vase in a classroom with the window closed. Do you believe there is air in the vase?
S12: Yes.
R: Why do you think that?
S12: Because before it was outdoor... and it was open... so the air could get into the vase. Now it is closed.
Table 1
Frequencies of Children’s Responses to Task 1

<table>
<thead>
<tr>
<th></th>
<th>Children aged 4–5 years</th>
<th>Children aged 5–6 years</th>
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<tbody>
<tr>
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<tr>
<td>Intermediate</td>
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<td>6</td>
</tr>
<tr>
<td>Insufficient</td>
<td>14</td>
<td>18</td>
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</tbody>
</table>

Task 2. Is there air inside the open vase that is placed inside this ‘closed’ space? (Figure 2).

In Task 2, children’s responses were classified into three distinct categories.

Sufficient responses. Here were classified those responses where the presence of air in the vase was recognized independently of the local elements in the indoor ‘close’ space. For example,

R: This picture depicts an open vase in a classroom with the window closed. Do you believe there is air in the vase?
S5: Yes.
R: Why do you think that?
S5: Because air comes from everywhere...
R: When you say everywhere, what do you mean? So, if I took this open vase and put it down away from the window would it still have air in it?
S5: Yes.
R: Why do you think this happen?
S5: Because air exists everywhere...
R: Even if the window is closed?
S5: Yes. Just like water comes in from everywhere, so does air.

Intermediate responses. Here were classified those responses where children seemed to recognize the presence of air in the open vase, provided however that the vase was located in a specific part of the room. For example,

S34: I don’t know it may or may not have...
R: Why may have air in it? How do you think about that?
S34: I don’t know... maybe because it is closed to the window...
R: Why may has not air in it?
S34: I don’t know... it may have...

Insufficient responses. Here were classified those responses where the presence of air was not recognized by children due to local room features such as the closed window. For example,
R: This picture depicts an open vase in a classroom with the window closed. Do you believe there is air in the vase?  
S2: No.  
R: Could the jar be somewhere else in the classroom to have air in it?  
S2: No… maybe in the case you switch on the air-condition and put it underneath….  
R: Only in the case I switch on the air-condition and put it underneath will it have air?  
S2: Yes.

Table 2  
Frequencies of Children’s Responses to Task 2

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<th>Children aged 4–5 years</th>
<th>Children aged 5–6 years</th>
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<td>9</td>
</tr>
<tr>
<td>Insufficient</td>
<td>9</td>
<td>14</td>
</tr>
</tbody>
</table>

Task 3. Is there air inside the closed vase that is placed in a room with an open window? (Figure 3).  
In Task 3, children’s responses were classified into three distinct categories.

Sufficient responses. Here were classified those responses in which the existence of air in the closed vase was recognized regardless the place it was located. For example,  
R: This picture depicts a closed vase in a classroom with the window opened. Do you believe there is air in the vase?  
S32: Yes, because it might have had a hole in it and the air would come in.  
R: If the vase was on the table away from the window, would it still have air in it?  
S32: Ναι. S32: Yes.

Intermediate answers. Here were classified those responses that recognized the presence of air within the confined space of the closed vase in case it was located at a particular point within the room. For example, S22: ‘(is there air inside the vase?) … Yes… (Why?) … because the window is open’.
Insufficient responses. Here were classified those responses in which the vase, being closed, could not have air inside it despite the window being open. For example,

R: This picture depicts a closed vase in a classroom with the window opened. Do you believe there is air in the vase?
S3: No.
R: If the vase was on the floor under the table, would it have air in it?
S3: No.
R: How do you think about it since the window is open?
S3: The vase is closed therefore air does not get in it even if the window is open.

Table 3
Frequencies of Children’s Responses to Task 3

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<th>Children aged 4–5 years</th>
<th>Children aged 5–6 years</th>
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<td>13</td>
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<tr>
<td>Insufficient</td>
<td>11</td>
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</tbody>
</table>

Task 4. Is there air inside the open vase that is placed in a room with an open window? (Figure 4).

In Task 4, children’s responses were classified into three distinct categories.

Sufficient responses. Here were classified those responses were the existence of air in the vase was recognized. For example

R: This picture depicts an open vase in a classroom with the window opened. Do you believe there is air in the vase?
S3: Ah yes, there is air in the vase.
R: If the vase was on the table away from the window, would it still have air in it?
S3: Yes, it will.
R: Is there any particular place in the picture where the vase could be without air?
S3: No, since air is everywhere.

Intermediate responses. Here were classified those responses that recognize the existence of air in the vase only in the case the vase is
placed in certain positions within the room. The property of ‘having’ air is attributed to these positions by the children. For example,

R: This picture depicts an open vase in a classroom with the window opened. Do you believe there is air in the vase?
S19: Yes.
R: Why do you think that?
S19: Because... hmmm... because it’s open and the window is open, so air is coming in.
R: If the vase was on the table away from the window on the carpet, would it still have air in it?
S19: No.
R: Why do you think that?
S19: ... (answers more confidently) Because it’s away from the window.

Insufficient responses. Here were classified those responses that did not recognize the presence of air within the vase.

R: This picture depicts an open vase in a classroom with the window open. Do you believe there is air in the vase?
S4: No.
R: Is there air in the opening of the vase?
S4: No.
R: In which place in the room could the vase have air in it?
S4: Maybe outdoor but being closed forever ... basically no... nowhere we could...
R: Why nowhere?
S4: Because the air would come out.

Table 4
Frequencies of Children’s Responses to Task 4

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<th>Children aged 4–5 years</th>
<th>Children aged 5–6 years</th>
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<tr>
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<td>21</td>
</tr>
<tr>
<td>Insufficient</td>
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<td>1</td>
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</tbody>
</table>

Task 5. Is there air inside the closed vase that is placed outdoor? (Figure 5).

In Task 5, children’s responses were classified into three distinct categories.
Sufficient responses. Here were classified those responses which posed that air exist everywhere within and without the closed vase, regardless of its position in the outdoor environment. For example,

R: This picture depicts a closed vase placed outdoor. The vase has never been opened. Do you believe there is air in the vase?
S15: Yes.
R: Why do you think that?
S15: Through the holes (pointing to the edge of the closed vase).
R: What happens in the holes and the vase has air?
S15: It takes air and sucks it.

Intermediate responses. Here were classified those responses in which children claim that air is present within the closed vase only when it is placed in certain positions outdoors or in various special conditions. For example,

R: Could you show me where should the vase be placed in order to have air in it?
S9: Here (pointing with his hand on the slide)
R: So, the closed vase has air in it.
S9: Yes.

Insufficient responses. Here were classified those responses that recognize that air exists in the outdoor environment but not within the closed vase. For example,

R: This picture depicts a closed vase placed outdoor. The vase has never been opened. Do you believe there is air in the vase?
S7: No, since the vase is closed it has not air. There is air outside but not within the vase as air cannot get in. It should be open in order to get inside.

Table 5
Frequencies of Children's Responses to Task 5

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<th>Children aged 4–5 years</th>
<th>Children aged 5–6 years</th>
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<td>Insufficient</td>
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<td>16</td>
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</table>
Task 6. Is there air inside the open vase that is placed outdoor? (Figure 6).

Task 6, children’s responses were classified into three distinct categories.

**Sufficient responses.** Here were classified those responses which posed that air exist everywhere within and without the open vase, regardless of its position in the outdoor environment. For example,

R: *This picture depicts an open vase placed outdoor. Do you believe there is air in the vase?*
S3: Yes, there is.
R: *If the vase was placed away on the swings, would it still have air in it?*
S3: Yes.
R: *If the vase was under the slide would there be air in it?*
S3: Yes everywhere.
R: *Is there any particular place in the picture where the vase could be without air?*
S3: There is not. Only if you placed it within the ground, that is dig it into the sand and cover it up, that it will be without air.

**Intermediate responses.** Here were classified those responses in which children claim that air is present within the open vase only when it is placed in certain positions outdoors. For example

R: *Is there any particular place in the picture where the vase could be without air?*
S10: Hmmm... yes down the slide.
R: *Why do you think that?*
S10: Because not so much air could get there.

**Insufficient responses.** Here were classified those responses in which children did not recognize that air exists in the open vase as air will probably escape from the top. For example,

R: *This picture depicts an open vase placed outdoor. Do you believe there is air in the vase?*
S14: Yes.
R: *Could you explain why there is air in the vase?*
S14: Because it is open in the top.
R: *Interesting... so, if the vase was placed away on the swings, would it still have air in it?*
S14: No.
R: If it was on the slide?
S14: No.
R: Could you show me where the vase should be placed in order to have air in it?
S14: No.
R: So, does the vase has air in it?
S14: No... since the vase is open in the top the air is escaping.

Table 6
Frequencies of Children’s Responses to Task 5

<table>
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<th>Children aged 4–5 years</th>
<th>Children aged 5–6 years</th>
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<tbody>
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Discussion

In the current paper were presented the findings of the way 4–6 years old children conceptualize the presence of air in open and closed vessels that are placed in spaces with different characteristics (indoor & outdoor). The results showed that children face significant difficulties in dealing with this issue. These difficulties are well reflected in the rather few sufficient responses that were given by the children across all 6 tasks.

The data analysis of our research showed that the well-known issue of centration seemed to play a key role in children’s responses. The so-called centration counts for the selective adherence to certain aspects or points of the situations presented to children that seem to dominate both their reasoning and predictions (Laurandeau & Pinard, 1972). Indeed, in the current study it was apparent that sufficient responses were clearly fewer in the tasks that dealt with closed vases. The same was also found in the tasks that dealt with rooms with an open window, although window centration was also found in the case of rooms with a closed window. While the differences in responses between tasks that dealt with closed and open vases was not statistically significant, it was clearly and systematically recorded.
The difficulties identified in the current study are consistent with the data found in the relevant literature. That is, the pre-logical explanations that dominate children's thinking, the instability in their responses across different tasks as well as the notion of centration have been extensively highlighted in the academic literature (Borghi et al., 1998; Kontili et al., 2023; Van Hook et al., 2005). However, the above-mentioned difficulties highlighted here a particular dimension to the way children conceptualize air since the tasks referred to specific discrete and restrictive spaces such as vases instead to the usual wider environment. In such tasks it is possible to establish the robustness and stability of sufficient responses of younger and older children who give answers that are consistent with school knowledge.

Finally, no statistically significant differences were recorded between the children of the two age groups. However, it is noteworthy that in some cases it was found that children in the younger age group tend to give answers closer to school knowledge either in the form of sufficient or intermediate responses. This finding is of particular significance and should be the subject of future research.

Conclusions and Perspectives

In the present study, an attempt was made to study the mental representations of 4–6 year old children for a specific physical condition: the presence of air in the containers.

From a didactic and pedagogical point of view, the results of the study lead us to the conclusion that the important obstacle to the understanding of air at the age of 4–6 years is the specificity of the containers. The essential obstacle relates to the difficulty that a fixed-shaped container, which is often closed, can be considered to have the same air properties as the rest of space. This difficulty obviously has implications for teaching since the change in the student's representations cannot be done spontaneously. Indeed, if the attempt to lead children to understand that air occupies every part of the space encounters the difficulty of the specificity of open or closed containers, special activities need to be created aimed at overcoming this difficulty.

These findings, in such a focused study, underline that understanding children's difficulties allows for a range of rational
choices, not only in the design of appropriate and effective teaching activities, but also at multiple levels: in the design of curricula, in the development of teaching materials and in the initial and ongoing training of teachers.

Undoubtedly, our findings are limited as they form part of a broader spectrum whose mapping needs to be completed. Along this line, it seems important that the qualitative nature of the studies would be combined with quantitative data in order to add value to the findings.

**ADHERENCE TO ETHICAL STANDARDS**

**Ethics Declarations.** All procedures performed with the permission of the teacher who participated in the research for the processing and analysis of their data. We also had the consent of the children’s parents and the decision of the Ethics Committee of the Department of Education Sciences and Early Childhood Education. All experimental procedures with human participation in the study complied with the ethical standards of the Helsinki Declaration of 1964.

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**Conflict of Interest.** The authors have no potential conflict of interest that could influence the decision to publish this article.

**Author’s Contribution.** **Evanthia-Markella Kontili:** Conceptualization, Methodology, Formal analysis and investigation; Writing – original draft preparation, Writing – review and editing; Management activities to annotate (produce metadata), scrub data and maintain research data; Resources, Preparation of tables; Programming, Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs. **George Kaliampos:** Conceptualization, Methodology, Formal analysis and investigation; Writing – original draft preparation, Writing – review and editing; Resources, Supervision, Preparation of tables; Programming, of the overall replication/reproducibility of results/experiments and other research outputs, Submission of a data set to the international repository. **Konstantinos Ravanis:** Conceptualization, Methodology, Formal analysis and investigation; Writing – original draft preparation, Writing – review and editing; Resources, Supervision, Preparation of tables; Programming, Software development, Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs, Submission of a data set to the international repository.

**Consent for publication.** The authors approve of this submission and, conditional upon the decision made by the editorial board from the peer-review process, consent to the publication of the current work. The work has not been, nor has it been submitted to other journals in consideration for publication.

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References


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Чи існує повітря у вазах? Ментальні уявлення дітей 4–6 років


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**АНОТАЦІЯ**

**Вступ.** Одним із важливих напрямів досліджень у контексті природничо-наукової освіти дітей раннього віку є вивчення ментальних уявлень дітей 3–8 років про явища та поняття науки, які формуються у школі. У цьому напрямі проводились дослідження за різними напрямами. Серед них невелика кількість досліджень була присвячена концепту повітря. Базові ментальні уявлення про повітря свідчать про те, що діти раннього віку не усвідомлюють його як матеріальну сутність і в своїх прогнозах сильно залежать від факторів, пов’язаних із елементами експериментальних ситуацій.

**Мета.** Метою даного дослідження є вивчення ментальних уявлень дітей 4–6 років про існування повітря у вазах.

**Методи дослідження.** Дослідження мало якісний характер, вибірку утворювала 41 дитина віком 4–6 років (26 дітей 4–5 років та 15 дітей 5–6 років).
Чи існує повітря у вазах? Ментальні уявлення дітей 4–6 років

Дослідження проводилося за допомогою напівспрямованих індивідуальних інтерв’ю. Дітей просили за допомогою 6 різноманітних завдань висловити свою думку щодо наявності повітря в закритих і відкритих вазах, які знаходилися в “закритих” або “відкритих кімнатах”, а також у зовнішньому середовищі. Обговорення ґрунтувалося на 6 цифрових малюнках, зображених у завданнях.

Результати. Наші результати показали, що досить мало відповідей відповідали шкільним знанням. Серед них найменше адекватних відповідей було в завданнях, що стосувалися закритих ваз. Хоча відмінності у відповідях між закритими та відкритими вазами не були статистично значущими, вони, тим не менш, систематично фіксувалися. Крім того, досить цікаво, що значна кількість дітей вважала відкрите вікно важливим фактором існування повітря у вазах. Загалом у відповідях дітей переважали дологічні пояснення, нестабільність у відповідях між різними завданнями, а також зосередженість на різних частинах малюнків.

Висновки. У цьому дослідженні стало очевидним, що виявлення труднощів дітей щодо існування повітря в закритих вазах дозволяє зробити низку раціональних виборів на різних рівнях: у проектуванні навчальної діяльності, у формульованні навчальних програм, у розробці навчального матеріалу та у підготовці вчителів. Також було наголошено на необхідності поширення дослідження на інші сфери, пов’язані з концептуалізацією повітря.

Ключові слова: повітря, ментальні репрезентації, раннє дитинство.