

Title: ORGANIZATION OF CHILDREN'S EXPERIMENTATION WITH SNOW AND ICE AS A MEANS OF FORMING IDEAS ABOUT THE AGGREGATE STATES OF WATER IN OLDER PRESCHOOL CHILDREN

Author: Rakhimova Diloram Mukhammedovna – Lecturer, Kokand State University

Co-authors: Rakhimova Rovza Jakhongir kizi – Student, Kokand State University

Affiliations: Kokand State University, Uzbekistan

Abstract. This article examines the pedagogical and methodological aspects of organizing children's experimentation with snow and ice to develop understanding of the aggregate states of water (solid, liquid, gas) in older preschool children (aged 5–7). Based on the works of Poddyakov, Veraksa, Dybina, and others, the study demonstrates that direct manipulation of natural materials – snow, ice, water – stimulates cognitive activity, voluntary attention, and the ability to establish cause-and-effect relationships.

Keywords: children's experimentation, aggregate states of water, snow, ice, older preschool children, cognitive development, voluntary attention, cause-and-effect relationships, preschool education, natural science concepts.

Introduction. The development of a child's personality in the modern educational paradigm is impossible without the formation of research skills and independent thinking. As emphasized by Veraksa and Galimov (2016), it is in preschool age that the foundation of a holistic understanding of nature and physical phenomena is laid. Water, as the most accessible substance, undergoes observable transformations: it freezes into ice, melts into water, evaporates into steam. These transitions (solid ↔ liquid ↔ gas) represent the aggregate states of water, and their comprehension is an important component of the natural science literacy of a future student. Older preschool children (5–7 years old) are characterized by an increased curiosity, a desire to independently test the properties of objects, and the

beginning of voluntary attention (Poddyakov, 2011). However, as noted in earlier studies (Muminova et al., 2022), attention at this age is still unstable, and the scope of attention remains narrow. Children's experimentation acts as a mechanism that compensates for these weaknesses: it requires concentration, distribution, and long-term retention of attention on a process that has a visible, interesting result.

The purpose of this article is to substantiate the methodology for organizing experiments with snow and ice as an effective means of forming ideas about the aggregate states of water in older preschool children, and to show the developmental effect of this activity on cognitive abilities.

Main Part

1. The Concept of Children's Experimentation and its Importance. According to Poddyakov (2011), children's experimentation is a special form of search activity in which the processes of goal formation, planning, and analysis of results are most clearly manifested. Unlike simple observation, experimentation involves active transformation of a situation. The child does not just see that snow melts in a warm room – he puts snow in different conditions (on a radiator, on a windowsill, in a refrigerator) and compares the speed of melting. This creates an “internal cognitive conflict” that stimulates thinking. Dybina (2017) notes that experimentation is most effective when working with natural materials: sand, clay, water, snow, ice. These materials allow repeated changes in state without losing the child's interest. Korotkova (2019) adds that systematic experimentation forms such mental operations as analysis, comparison, generalization, and classification.

2. Methodology for Organizing Experiments with Snow and Ice. Based on the recommendations of Ivanova (2018) and Tugusheva & Chistyakova (2020), we propose a three-stage organization of children's experimentation within a preschool institution or family.

Stage 1: Preparatory – accumulation of sensory experience and motivation.

In winter, during walks, children observe snow and ice. They note properties: snow

is white, cold, fluffy, can be molded when wet; ice is transparent, hard, slippery, cold. The teacher asks questions: “What will happen to snow if we bring it into the group? Why are icicles hanging on the roof?” A problematic situation is created: “A toy is frozen in a piece of ice. How to get it without breaking the ice?” This activates involuntary attention due to novelty and emotional involvement.

Stage 2: Direct experimentation (in a mini-laboratory, indoors).

The following series of experiments are carried out (Zemtsova, 2021):

- **Experiment 1: “Snow – water – ice” (closed cycle).** Children pour water into a mold, take it outside. Next day they see ice (solid state). Ice is brought into the room – after a while it turns into water (liquid). Water is poured into a saucer and left for 2 days – it disappears (evaporation, gaseous state).
- **Experiment 2: “Comparison of melting speed.”** Three identical pieces of ice are placed: on a saucer at room temperature, on a radiator, in a cup of cold water. Children measure time using an hourglass. Conclusion: the higher the temperature, the faster the transition from solid to liquid.
- **Experiment 3: “Does ice sink?”** Children put a piece of ice into a glass of water. Observation: ice floats on the surface. Explanation: ice is lighter than water because when water freezes, the distance between molecules increases.
- **Experiment 4: “Colored ice.”** Water is tinted with gouache, frozen. Children see that ice takes the color of the water. This reinforces the idea that ice is frozen water, not a separate substance.

3. The Influence of Experimentation on the Development of Attention and Cognitive Abilities. Tugusheva & Chistyakova (2020) emphasize that experimentation directly affects the properties of attention that are most problematic for older preschoolers.

- **Volume of attention.** In the process of group experimentation (e.g., “We are building a castle from snow and watering it with water to make it stronger”), the child must simultaneously monitor several objects: the shape of the castle, the amount of water, the actions of other children. This trains the expansion of attention span from 1–2 objects to 3–4.
- **Distribution of attention.** When conducting the experiment “Where will the ice melt faster?” one child monitors the time, another – the temperature near the radiator, a third – the condition of the ice. Each distributes attention between his own instrument and the object of observation.
- **Stability of attention.** The expectation of a result (for example, waiting for ice to melt in warm water) can take 5–10 minutes. This requires the child to keep his attention on the process without switching to extraneous stimuli. Regular experimentation increases the time of voluntary concentration.
- **Voluntary attention.** Unlike playing with sand, experimenting with ice and snow has strict rules: you cannot put snow in your mouth, you cannot throw ice, you must follow the sequence of actions. Fulfilling these rules is impossible without developed voluntary attention.

Korotkova (2019) notes that children who regularly participate in experimentation show a higher level of curiosity and ask more “why” questions. They are less likely to be distracted in class and better retain the algorithm of actions.

Conclusion. Thus, the organization of children's experimentation with snow and ice is an effective means of forming ideas about the aggregate states of water in older preschool children. This activity contributes to:

1. The conscious assimilation of knowledge about the transitions of water from solid to liquid to gas.
2. The development of cognitive activity and mental operations (analysis, comparison, generalization).

3. The training of properties of attention: volume, distribution, stability, and voluntariness.
4. The formation of research behavior and a natural science worldview.

Based on the analysis of the works of Poddyakov (2011), Veraksa & Galimov (2016), Dybina (2017), Ivanova (2018), Korotkova (2019), Tugusheva & Chistyakova (2020), and Zemtsova (2021), it can be argued that experimentation should become a mandatory component of the educational process in the older groups of preschool institutions. The teacher's task is to create a subject-spatial environment for experiments, to develop a system of interesting problem situations, and to ensure safety. Further development of research skills will continue in elementary school, but the foundation – the ability to see the cause and effect in the transformation of substances – is laid precisely in preschool childhood through experiments with snow, ice, and water.

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