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EXAMINATION OR PLAY? THE COGNITION OF THE NEAREST SORROUNDING BY THE 5 TO 9 YEAR-OLD CHILDREN

FORSCHEN UND SPIELEN. BEOBACHTUNGEN IN DER NATUERLICHEN UMGEBUNG IN DER GRUNDSCULE (KINDER ZWISCHEN 5 UND 9 JAHREN)

Das Kind beobachtet die umfassende Wirklichkeit – wie naturwissenschaftliche Phänomene, Wirkungen der technischen Anlagen, Arbeit und Verhalten der Leute mit Neugierde, Faszination mit seinem Erstaunen ob manchmal auch mit Ängsten.

Die bemerkten Tatsachen werden im Kopf behalten, um sie zu erläutern – fragt Erfahrene um die Phänomene erklären („warum?“, „Wie?“, „Auf welcher Weise?“, „Für was?“) mit der Vereinstimmung zu Eigenart auf die psychokörperliche Entwicklung – möchte die Welt mit allen Sinnen erkennen – berührt, beobachtet, beschnüffelt, schmeckt, hört...

Wenn das Kind alle Gefühlssinne in Erkenntnis der allernächsten Umgebung angagiert desto besser werden die Kenntnisse gemerkt (im Kopfe behalten), kann seine Aufmerksamkeit, auf durchgeführtem Experiment, konzentrieren, in der Absicht eigener Möglichkeiten diese Phänomene zu erläutern.

Je die Tätigkeit mehr selbständig ist, desto besser wird das Kind mit der naturwissenschaftlicher, gesellschaftlicher als auch technischer Umwelt vertraut. Im Laufe der Untersuchung, interessant fürs Problem, das Kind überlegt über die Ursachen und Wirkungen zieht Folgerungen, macht Gebrauch vom Zubehör und Materialien, vor allem erkennt andere Möglichkeiten um Information über die Umwelt durch Suche und Entdeckung, erwerben.

In Auftritt wird die Kinderwissenschaft – Vergleich der Kinder die Wissenschaft durch eigene Erfahrung oder im Scheu, erreicht haben (der Lehrer hat die Scheu durchgeführt), vorgestellt.

Es werden auch andere Probleme besprochen wie: Interesse der Kinder mit Forschungsspielen im Zusammenhang mit der Natur, der Einfluss auf die Dauerhaft der Kinder-Wissenschaft über umgebenes Milieu, es werden auch einige Beispiele von Kinderaussagen präsentiert die auf Ihre Weise die beobachtende Phänomene erläutern probieren.

Every child observes the surrounding reality – natural phenomena, technical appliances' work and human behaviour with sheer curiosity, fascination, involvement and sometimes with a dread.

He or she tries to describe and explain all perceived facts – by asking the adults about the nature of a given phenomenon ('Why?, How?, In what way?, What for?') or in accordance to the specificity of its psychophysical development, he or she tries to become acquainted with the world by means of all senses: the child touches, observes, smells, tastes or listens…

When a child involves all senses, he or she remembers better, is more interested in the activity, can focus more easily – and to some extent, it tries to explain the phenomenon. As

John Dewey stresses 'child's thinking is inspired by its own activity and scientific work'[1], and Jerome S. Bruner remarks that 'a child perceives and acquires knowledge better through its own work connected with examination and experimenting'[2]. Examination activities are part of concrete – motorial thinking and can appear in two varieties: one in which the aim is to know an object and the other focuses on the achievement of a specific goal. After initial tests, which are often unsuccessful, children get accustomed to the structure of the act, its stages and meaning. Carl Rogers stresses the great role of experiential

learning i.e. through experience and independent sensation, which is filled with pupils' individual involvement'[3].
Examination is here understood as detailed, thorough cognition[4] whereas an investigative play consists in different experiments on various thing conducted by the child itself.' A child gets hold of the reality, investigates the features of various objects, phenomena and at the same time the child is satisfying its intellectual curiosity by receiving numerous sensations.'[5]

It is very hard to set examination and play apart, nevertheless, observing children during the conducting of various experiments, their curiosity, inteness and concentration and analyzing children's' trials to explain given phenomena one can state that, the more individual activity there is, the better the children perceive and understand the closest surrounding (natural, technical or social ones). This fact was confirmed by research conducted among 5 to 9 year olds. Answers given by little explorers, after having conducted an experiment by the children themselves (Group A) were analyzed and confronted with the answers given by children in Group B, in which they were only observing an experiment conducted by the teacher.

Four different experiments were conducted in the two groups. They all concerned inanimate nature and are presented on the photographs. 43 children conducted the experiments themselves (Group A) and 45 were just observers (Group B).

Experiment 1 aimed at explaining the influence of the temperature on the convection of liquids. Experiment 2 tried to provide explanation of the influence of the liquid consistence on the floating of objects. The aim of the third test was to

establish the importance of oxygen in the process of deflagration and the fourth one allowed to explain the force of oxygen.[6]

The experiments conducted by children from Group A are presented in the photographs. After having conducted all the tests, the children were asked to explain the nature of the earlier presented phenomena (the kindergarten children answered orally while the early-school children wrote their answers down).

The first question concerning the first experiment was:
'Why did the hot (colored) water *tower out* from the bottle?'
The children answered correctly in the following ways:

- '…because it needs more space than the cold water…'(Paweł, 6;7)
- '…because it has too little space in the bottle…'(Ania, 5;4)
- '…hot water needs more space than cold water…'(Julia, 5;10)
- '…because it expanded and doesn't fit the bottle…'(Piotr, 8;4)
- '…hot water rises over the cold one because it is lighter…'(Ania B., 8;2)

[1] J.Dewey, How do we think, Warszawa 1967, p.57
[2] J.S. Bruner The Process of Education, Warszawa 1964, p.21
[3] C. Rogers, Freedom to Learn, Columbus 1969, Charles E. Merrill, p.103-153
[4] A Small Polish Language Dictionary, editor E. Sobol, Warszawa 1995, p.32

[5] M. Kwiatkowska, Z. Topińska, Kindergarten Pedagogic, WSiP, Warszawa 1978, p.39
[6] all experiments are from: N.Ardley, 101 Great Science Experiments, London 1993, Dorling Kindersley Ltd., p. 7,9,20,21

but there were also wrong answers:

- '…hot water towered to the cold one because it liked to do that…'(Michał, 6;3)
- '…because somebody put some explosives inside…'(Wojtek, 6;5)

Those children, who conducted the experiment themselves, gave correct and to the point answers (92,7%), whereas only 60% of correct answers were observed in Group B. The percentage of wrong answers is much higher in Group B, also more children could not explain the experiment at all.

Detailed data is presented in Table 1.

Table 1.
5 to 9 year-old children's answers to the question:
'Why did the hot water tower out from the bottle?'

ANSWERS	GROUP A	GROUP B
Correct	92.71%	60 %
Wrong	6.25%	13.75 %
Lack of answers	1.04%	26.25%

The second research aimed at explaining the nature of object floating. The play induced the following answers to the question: 'Why do certain objects float on various levels and others do not?
The correct answers:

- '…some objects in the container float because they are light and others drown because they are heavy…' (Karolina 9;1)
- '…those which are light do not drown and the heavy ones do…' (Martyna 6;5)
- '…only heavy objects drown…' (Szymon 8;7)
- '…they float on different levels according to their weight…'
- '…it depends on the weight of the object and the density of the liquid; they float in the viscous fluids best because they can carry them…' (Kamil 8;10)

And wrong answers:

- '…all objects thrown into the container will drown…' (Grzegorz 8;7)
- '…they will drown, they cannot swim because they did not learn how to swim…' (Piotr 6;2)
- '…objects float on various levels because they have different colors…' (Sonia 7;7)
- '…in order to look nice…' (Paulina 6;5)
- '…they float best in the colorless liquids…' (Diana 7;4)

Number analysis of the obtained answers, again, shows majority of children (77.08%) who conducted the experiment themselves were able to give correct answers with 8.34% of wrong answers and 15% of cases where there was no answer. In the control group, the percentage of correct answers is two times smaller. Details are presented in Table 2.

Table 2.
Answers to the question:
'Why do certain object float on various levels and others do not?'

ANSWERS	GROUP A	GROUP B
Correct	77.08 %	38.75 %
Wrong	8.34%	23.75%

Lack of answers	14.58 %	37.5%

During this experiment, children posed a new question themselves: 'Why do the liquids not mix?'
Children tried to explain this saying:

- '…the liquids did not mix because they are not the same…' (Angelika 8;5)
- '…because they are not of the same density…' (Małgosia 8;10)
- '…because these are thick and sticky and the others are not…' (Łukasz 5;10)

However, also wrong answers appeared:

- '…liquids did not blend because these colors do not like to mix with each other…' (Paulina 6;5)
- '…because there is an invisible threat between them…' (Mateusz 8;7)
- '...they blended…' Jacek 9;2)

Wrong and correct answers' number lists for both groups are included in Table 3.

Table 3.
Answers to the question: 'Why do the liquids not mix?'

ANSWERS	GROUP A	GROUP B
Correct	75 %	25 %
Wrong	12.5 %	40 %
Lack of answers	12.5 %	35 %

For children, who only observed the experiment done by the teacher (Group B), this phenomenon turned out to be very mysterious, children gave wrong answers more frequently or they did not know the answers at all.

The next experiment (Number 3) allowed children to account for the use of oxygen in the process of deflagration. Little explorers explained this fact in the following ways:

- '…the candle covered by a jar goes out after some time because it uses the whole supply of air…' (Szymon 8;7)
- '…because it lacks oxygen…' (Daria 8;4)
- '…because it cannot breathe, the air is lacking…' (Paulina 6;5)
- '…because it burnt the whole air and its place was taken by water…' (Magda 8;7)
- '…flame to burn needs oxygen…' (Małgosia 8;10)
- '…the candle covered by a jar because it is afraid of being locked up…' (Piotr 8;4)
- '…because it thinks that people want to imprison it…' (Kamil 5;9)
- '…because it does not like the jar…' (Jola 6;2)
- '…the jar does not make any difference, I think…' (Paweł 6;7)
- '…water flooded the flame and water extinguishes flame…' (Paweł Z. 8;5)

Again children from Group A gave correct explanations more frequently which is clearly shown in Table 4.

Table 4.
Answers to the question: 'Why does a candle covered by a jar go out?'

ANSWERS	GROUP A	GROUP B
Correct	69,44 %	53,3 %
Wrong	9,73 %	11,7 %
Lack of answers	20,83 %	35 %

The fourth experiment also intrigued the explorers, who tried to explain: 'why were the walls of the bottle sucked inside?

The following answers appeared:

- '…because the air in the bottle got hot because of the water. When the bottle was cooled the air decreased and sucked the bottle in…' (Krzysztof P. 8;10)
- '…because the hot air increased and when the ice cooled it, the air decreased…' (Jacek 9;2)
- '…because ice cubes hit the walls of the bottle and this way they pushed them inside…' (Justyna 9;3)
- '…because Jacek touched the bottle and squeezed it…' (Magda 8;7)

The observed phenomenon was quite difficult for children to explain and the number of correct answers in both groups (A and B) was rather similar.
This is presented in Table 5.

Table 5.
The answers' percentage for the question: 'Why were the walls of the bottle sucked inside?'

ANSWERS	GROUP A	GROUP B
Correct	33.08 %	31.25 %
Wrong	35 %	30.25 %
Lack of answers	31.02 %	38.5 %

The experiments' result's analysis shows that independent child's activity, practical realization of the experiment significantly increase the level of cognition of action – reaction relations. It stimulates fact analysis and formulating correct though sometimes infantile and naive conclusions, but at the same time it prompts meditation. Such activities release various sensations (emotional, esthetic and intellectual). Perceiving facts is strictly connected with the process of thinking – not only does a child gather data but he or she compares, looks for similarities and differences, discusses the subjects of the experiments and reasons their causes out.

During voluntary explorations, a child 'gets to know another way to gain knowledge – through research, quest and discovery'[7], such a child learns how to use different tools and accessories, he or she prepares oneself to follow the instructions. In such circumstances, a child practices many skills: how to realize plans and intentions and also he or she starts to notice interesting events, which surround a child. The tutors' aim is to stir little experimentators

[7] E. Barańska, E. Tokarska, A Kindergarten Child Meets the World, in 'Kindergarten Education' 1989/6, p.361

research curiosity and allow them to look for correct answers by themselves as this way learning is more pleasurable and its effects are more imperishable.