

Using Technology "Theory of Inventive Problem Solving" in the Education and Development of Preschool Children

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Abstract – This article describes the possibilities of using the technology "Theory of Inventive Problem Solving" in the process of formation and development of creative abilities and systematic knowledge in preschool children.

Keywords – Theory of Solving Inventive Problems; Systemic Use; Speech Development; Creative Imagination, Flexibility and Mobility of Thinking, Search Activity, Striving For Novelty, Preschool Education.

Weak sides of activation of sorting options are lack of criteria solutions sought in a low handling and process – governance solutions; the driving contradictions saves the time when searching for solutions to various options but losing in evaluating gained options.

Scientists F. Bacon, R. Descartes, A. Osborne, F. Zwicky, J. Gordon and others, synthesizing philosophical and mathematic approaches have tried to improve the trial and error type. So there appeared methods as brainstorm (A. Osborne), sinegiki (J. Gordon), multidimensional arrays (F. Zwicky), etc.

Theory of Inventive Problem Solving (TIPS) regularly appeared in the second half of XX century as means to resolve this contradiction. Analysis of tens of thousands of patents of invention allowed to the former of TIPS, G.S. Altshuller make after – blowing conclusion that technical systems evolve by objectively existing laws that are known, identified and offered conscious performing of old and new systems.

Invented by the scientist and his followers the system of laws of development of technical systems formed the basis of TIPS.

Historically, the essence of TIPS is focused on search for solutions, combined with the selection of the strongest among them without busting the continuous weak. **The basic principles upon which TIPS solve this problem as follows:**

- **Objectivity of laws:** a system developed for the objective laws which must be studied and used in the process of solving problems;

- **Presence of contradictions:** the problem is difficult because it contains a contradiction, which should identify and resolve;

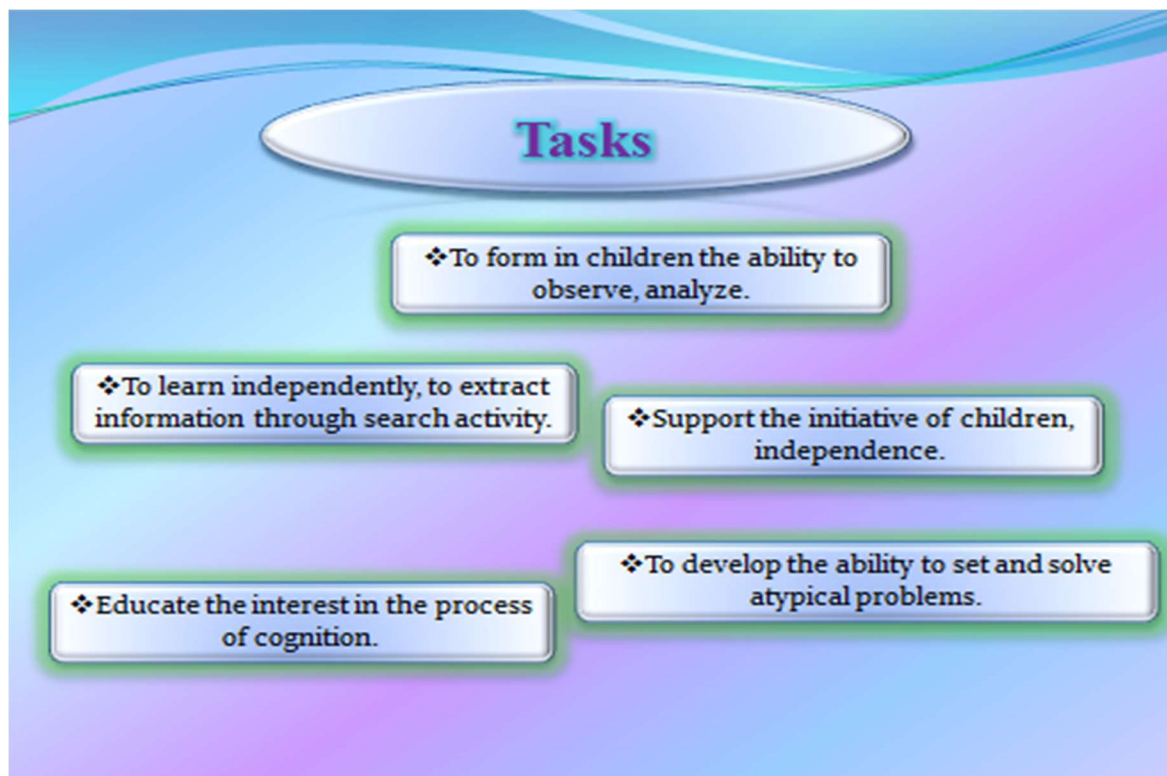
- **Concrete solutions:** specific resource acquires specific characteristics in specific circumstances.

As a result of the development TIPS became the basis for a practical methodology for analyzing the problems

encountered in the functioning of artificial systems. Currently, based on TIPS theory is formed many artificial systems development theory.

The main stages of the thought processes of analysis, these theories are increasingly being used in education as a basic methodology for the development of a culture in thinking and logic.

Areas of application of modern TIPS is very broad: to build plots of literary works, paintings, art (Y.S. Murashkovsky, S.V. Kozlovsky, etc.), biology (V.A. Buhvalov, I.I.Samal, V.I. Timokhov, etc.), mathematics and mathematical development methodology (A.A. Strauning, A.V. Khutorskoy, V.M. Tsurikov and others), geography (T.



V. Ivanov and others), pedagogy and psychology (A.N. Tubelsky, N. N. Khomenko, I.S. Yakimanskaya, etc.) – now in Ukrainian laboratories of pedagogy based on TIPS is developed a structure of “Ahead of pedagogy” (L.I. Shragin, M.I. Meerovitch, etc), even in business (V.G. Siberyakov, S.V. Sychev, V.I. Timokhov, S.A. Fayer, etc.) and advertisement (I. L. Vikent’ev, etc.).

Prospects of development of TIPS in the sphere of education are as follows:

- *Visual and remote seminars for teachers and distributing the literature;*
- *Develop programs and teaching methods of individual behavior and coordination them together;*
- *Creation of cross – cutting programs of continuous learning in preschool organizations and school.*

There is a trend of the escalating TIPS theory to the artificial systems development theory, creative personality, other private spheres, for example, methods of mathematical development.

We define the basic concepts of TIPS, used in children’s mathematical development.

Algorithm of inventive problem solving is step by step performing of mental operations, based on objective laws of development of technical systems and suggested to analyze technical problems and find the most effective solutions.

An algorithm for solving problem situations is modification of an algorithm of inventive problem solving, based on objective laws of artificial systems development and designed to analyze problems and find their most effective solutions.

The system is a set of elements that form when combining the new property, which does not have a single element is designed to perform a specific function.

The ideal system is the structure of the system tends to zero, but the ability to perform its functions at the same time does not decrease (in other words, the system does not exist, but its function retains and works).

Super system is the union, in which the system itself, considered to be a constituent part.

Subsystem is a part of the system.

Element of the system is a trivial part of the system (the trivial degree is conditional, and is corrected within the meaning of the concept of subsystem).

System Operator–3–9–or 18–screen diagram of powerful thinking. Let us explain: every subject, the object or phenomenon of environment or of the world can be considered as a system, which is a super – system, being one of its parts; interacting with other parts, the system is composed of the cooperating parts – the subsystems (Figure 1).

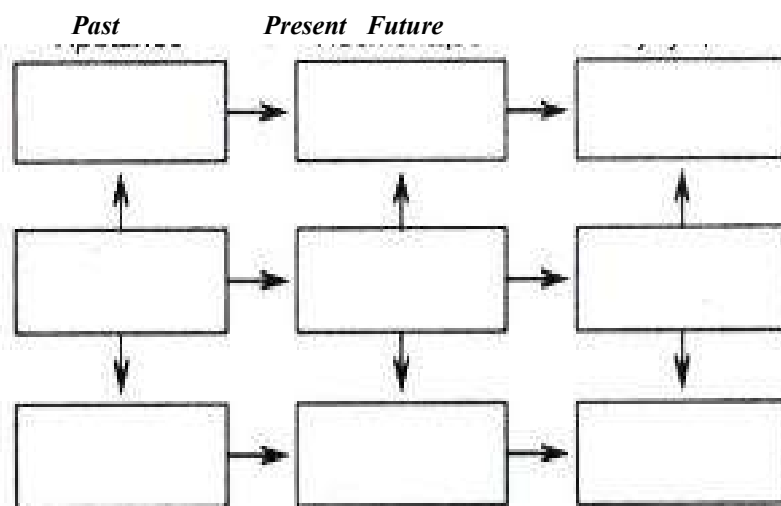


Figure 1. The whole scheme of System Operator.

For example, the concept – a dozen – the system – one of the nearest super – systems in which it is included as an integral part, will be “hundreds”, as one of the subsystems – “unit”. For the concept of the “triangle” super – system will be the concept of “form”, a subsystem – “point”.

TIPS and methodology of the child's mathematical development

The desire to use technologies, effectively developing child's intellectual, sensory and creative abilities, – is a characteristic feature of modern techniques of mathematical development. The most important goal at the same time – help the child in the transition from non – reflexive sequence of conscious mastery of mental operations that make up the thought process. The teacher's attention is accented not so much on the need of getting the correct answer from the child, but on the understanding of how to get it.

The objectives of adapting the elements of CTST and TIPS to the children's mathematical development can be:

- *Correction and activation of mental processes.*

- *Improvement of cognitive processes and creating the need for mental activities.*
- *Development of creative potential.*

To achieve them there are used such methods and techniques of TIPS as the isolation and resolution of problem situations, the design based on the fairy tale characters fantogrammy, organization and performing logic TIPS exercises and special TIPS exercises and games, organization of children's activities reflection. Let us examine them in detail.

Problem situations can be distinguished from the favorite works of children's literature, children's animation and documentary movies, Internet training, fairy tales, stories and even plot games. At the same techniques of resolution of conflicts, those are already available for the senior preschool children, as follows:

- *Separation of a source of controversy in space and time;*
- *Transition to the micro level;*
- *Access to the super – system;*

- *A combination of opposites at different system levels.*

Gradually, under the guidance of teachers and parents, preschoolers learn to devote themselves contradictions from stories, tales, which are available to them.

To solve the problem situations children can use the **game algorithm "Grabber"** (version and an example of A.V. Limarenko).

1. *Problem (state the problem).*
2. *The contradiction (to formulate a creative game contradiction "situation puzzle")*
3. *Ideal final result (to formulate the ideal final result – IFR).*
4. *Resources (Find resources, "search in your pockets", find "coins" and "pay" for the decision).*
5. *Principles (find the principle (s) of the decision).*

The Usage of logic TIPS exercises

For the mathematical development of children, the following **types of TIPS exercises** are used.

"Finding common features": take two objects spaced away from each other on the sense axis, and find them as many common features as possible.

"Search analogs": name the object and find its analogues as many as possible that are similar to it on various essential features.

"The third is odd": take three objects, widely separated from each other in the sense axis; find in the first and second (or the first and third or second and third) sites are common features that are not available in the third (or second or first) "extra" object or the odd one.

"Search the opposite object": name an object and tell as many opposites to the given one as possible.

The algorithm of implementation of TIPS exercises (author's version of L.I. Shragina).

1. *To call for each object: its primary function as a system; essential and nonessential attributes; extra function, use its value in a figurative sense; subsystem (if any); super – system (possible).*
2. *Perform the exercise in accordance with its meaning, using shown in Sec. 1 data.*

Here is **an example of the exercise** "Finding common features" – for objects "four" and "trapezoid".

The main function of the object "four" as a system – is quantity identification, the object "trapeze" – is the designation of a certain class of geometric shapes.

The essential features of the object "four" are as follows: consists of four units, and two smaller numbers (1 and 3 or 2 and 2); object "trapeze": two opposing sides are parallel, the other two – no. *Minor signs or features* of object "four": the letter F That is in the name of the word, etc.; object "trapeze": the name includes the letter **m**, similar to the roof of a house or a bus, and others.

Additional functions that can perform object "four" – is to decorate clothing, be part of a number, showing the shoe size, etc.; object "trapeze" – can be a part of the ornament on clothes, can be a coffee stand and others.

Subsystems for object "Four" – is four units, vowels and consonants, included in the word "four"; for object "trapeze" – is four sides, four tops, vowels and consonants included in the word "trapezoid".

Super system for the object "Four" – is a dozen, a hundred, mathematical abstraction; for object "trapeze" – is quads, mathematical abstractions.

So, common features are found in all highlighted in algorithm exercise "Finding common features" levels. The using of logic TIPS exercises significantly improves the organization and focus of mental processing of children, giving them the skills of functional system analysis, which is effective in all kinds of activities.

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