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# Tools to Study Behavior and Activity: Psychologists' Inventions as a Component of Cultural-Historical Process

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Specially designed cultural tools of psychologists' and ethologists' research activity are considered. The tools are objects stimulating a living being (an animal or a human) to unfold its behavior (activity) and, due to it, providing opportunity to study the behavior (activity). They serve as a base for psychological science and are included in systems of relationships between many people. A history of inventions of these objects (from behaviorists' puzzle boxes, gestalt psychologists' instruments and experimental objects designed in A.N. Leontiev's activity approach to the newest objects) is a part of intellectual history of humankind and unfolding of its creative potential towards self-development and self-cognition. Some part of the objects become, in a transformed form, objects of mass culture (e.g. toys). These inventions by psychologists and ethologists are a component of cultural-historical process and modern humankind's activity structures.

***Keywords:*** tools of psychologists' research activity, activity theory, A.N. Leontiev, invention, creativity.
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# Орудия изучения поведения и деятельности: изобретения психологов как составляющая культурно-исторического процесса

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В статье рассматриваются особые специально разрабатываемые вещественные средства, культурные орудия исследовательской деятельности психологов и этологов. Это объекты, стимулирующие другое живое существо, обладающее психикой (человека или животное), развернуть свое поведение, деятельность, процессы психического функционирования и позволяющие тем самым изучать их. Данные культурные орудия служат одним из оснований психологической науки и включены в систему отношений со многими людьми. История изобретения этих объектов, начиная с проблемных ящиков бихевиористов, экспериментального инструментария гештальт-психологов и экспериментальных объектов в научной школе А.Н. Леонтьева и заканчивая последними новинками в данной области, — это часть интеллектуальной истории человечества, история развертывания его творческого потенциала в направлении саморазвития и самопознания. Часть этих объектов в трансформированном виде становятся объектами массовой культуры (например, игрушками). В целом, данные объекты — изобретения психологов и этологов — являются составляющей культурно-исторического процесса и структур деятельности современного человечества.

***Ключевые слова:*** орудия деятельности психологов, теория деятельности, А.Н. Леонтьев, изобретения, творчество.

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> Every object made by man — from a hand tool to the modern electronic computer — embodies mankind's historical experience and at the same time also embodies the mental aptitudes moulded in this experience. This point conies out even more clearly perhaps in language, science, and works of art.
>
> *A.N. Leontiev.* The Development of Mind [7, p. 308].

## Stimulus objects of experimental psychology as tools for research

In this article we will consider experimental objects created by psychologists and ethologists with a special purpose. This purpose is to stimulate, provoke another living being, possessing a psyche, to such a deployment of a certain behavior or activity, which allows the researcher to study this behavior's or activity's patterns and features. One can say that these objects are among the types of material tools for psychologists' and ethologists' research activities. A.N. Leontiev wrote: "Vygotskii isolated two principal interrelated features that must be considered basic to psychological science. These are the equipped ("instrumented") structure of human activity and its incorporation into the system of interrelationships with other people. It is these features that determine the characteristics of psychological processes in man" [6, p. 45]. There would be no exaggeration to say that psychologists' and ethologists' tools under consideration are a very important part of their research activity structure, serve as one of psychological science's foundations, and are included in their system of relations with other people — fellow researchers and plenty of those who are neither psychologists nor ethologists.

Hence, E.A. Klimov's classification of tangible means, labor implements can be extended. According to him, there were the following tools of cognition (receiving, obtaining, "mining», processing of information).

"1. Devices, machines that give an image (binoculars, microscope, television system).

2. Devices, machines that give a conventional sign, symbol, signal (voltmeter, thermometer, mnemonic scheme on the dispatcher's control panel signal board).

3. Devices, machines that process information (counters, electronic computing machines)" [4, p. 75].

From our point of view, it is worth adding here material instruments that stimulate another living being (human or animal) to deploy its behavior, activity, mental functioning processes and that allow studying them (collecting and processing information about them).

A.N. Leontiev in his monograph "The Development of Mind" [7] discusses the outcomes of researches when such devices were used. These are, for example, curved spades used by P.Ya. Galperin [2] during his study of the process of children's manual tools acquisition (note that spades here have two functions — they are manual implements for a child and instruments of exploring tool activity for a psychologist), an aquarium with a cheesecloth partition to study behavior of American catfish finding the way to food in A.V. Zaporozhets's experiment, and, certainly, the original apparatus for studying the possibilities of forming light sensivity of the palm skin. Earlier A.N. Leontiev's work, co-authored with V.I. Asnin, presented a child's intellectual activity research using the original variable problem box [1].

The monograph "Development of Voluntary Movements», written by A.V. Zaporozhets, who represented the activity approach and was A.N. Leontiev's colleague and friend, also describes many experimental objects specially designed to acquaint participants of psychological experiments with the tasks important for mental development comprehension [3].

In our view, the objects specially elaborated by psychologists and ethologists to analyze behavior and activity can be interpreted in terms of B. Latour's actor-network theory as research tools — "nonhuman actants». "I propose to call whoever and whatever is represented actant" [5, p. 143; quoted from: 12, p. 250]. The objects we are describing represent their developers — for instance, an experimental setup interacts with a participant in a psychological experiment in some way prescribed by the developer, reacting to some actions and ignoring others, etc. Consequently, in Latour's terms, it is a nonhuman actant.

According to Latour, the research tool (experimental setup) provides "an inscription that is used as the final layer in a scientific text" [19, p. 68] — in an article, dissertation, etc. With regard to psychological researches, an experimental setup (e.g. for studying cogitation) allows the scientist to interpret what a participant does with it, which is reflected in the protocol transcripts, in

terms of rational thinking norms and deviations from these norms, heuristics, algorithms, etc. [10].

Several of these tools of psychologists' research activity become mass-cultural objects after being transformed. For example, observational experimental objects for analyzing children's curiosity and exploratory behavior turn into starting points for the development of bulk products — such as factory-made cause-and-effect toys and discovery toys [11].

## The creative thinking of an inventor of object for exploring psychologically alien behavior and activity

Let us ask ourselves the question: how did Karl Duncker invent his famous X-ray problem, which has become a classic of psychological research on thinking and continues to be used today? How was the "Mathematical Imagery Trainer for Proportion" that responds to the ratio of a participant's right to left hand height above the table invented? The display is green if the participant's right hand with a clasped box is twice as high as the left hand with the second clasped box, and in all other cases the display is red [13; 14; 17]. How could such an object come to mind? Whom and how was the puzzle box invented to study thinking and solving problems: a) by two capuchins; b) by two chimpanzees; c) by two preschool children? [16]. And what about the objects for analyzing the "tool activity" of birds [20] and bumblebees [8; 15]? These examples could go on and on — many psychologists and ethologists will surely offer their own sets of examples of such experimental objects.

Take a look at the study of people's creative thinking as an essential part of human psychology and activity.

From our point of view, the invention of problem situations and objects to explore other people's creative thinking is a distinctive kind of creativity, imaginative thinking that forms part of humanity's artistic civilizational potential.

Such a mindset includes at least three components [21].

1. The key element of abilities to create problem situations and tasks for alter is a special segment of the concept model of this alter — how he (an individual, a group, a representative of another biological species) will cope with the difficulty and what happens as a result.

2. Creativity in the field to which the created object's properties and connections, intended for examination and reflection of participants of the experiment (e.g. in mathematics, logic, mechanics, etc.), refer.

3. Engineering-design creativity — ability to invent design and technical solutions.

The stage of such an object's practical construction is also interesting. A.N. Leontiev wrote: "When I occupy myself with scientific work, my activity is, of course, a thinking, theoretical one, but during it several objectives become singled out for me that call for external practical activity. Let us assume that I have, for example, to set up a laboratory experiment (and I mean to set it up, and not just think it up or design it), and that I get about laying wire, driving screws, sawing, soldering, etc.; in mounting the equipment I perform actions that, though practical, nevertheless form part of the content of my theoretical activity and that are senseless without it. Let us assume, further, that the way of including some instrument or other that forms part of the set-up requires me to pay attention to the level of the general resistance of the electric circuit, and that I mentally calculate this while fixing the leads to its terminals; in that case conversely, a mental operation forms part of my practical action" [7, p. 188].

In my turn, I can give an example where the mental activity of elaborating, designing an experimental object and its practical construction were linked by feedback loops. Making one of my experimental objects and practically assembling its electrical diagram (with diodes, electric rectifier, etc.), I realized how to create it in such a way that the object could function in two more modes besides the one originally conceived and provoke the participant to set and solve two more types of arithmetic problems. Subjectively, it was my insight. When I saw the electrical diagram I had already assembled, it provoked me to understand how it could be developed to make the tool for psychological researcher I was creating more multifunctional [9]. The phenomenon of new things emerging (including new goals and themes) during the research practical development is analyzed in [18].

Overall, creativity in creativity studies, as well as in studies using specially crafted implements, appears to be a natural phenomenon.

## Conclusion

Psychologists and ethologists create special material means, their research activity's cultural tools. These are objects that stimulate another living being possessing a psyche (a human or an animal) to deploy its behavior, activity, mental functioning processes, and thus allow studying them. Such cultural tools serve as one of the bases of psychological science and are included in the system of relations with many people. The history of these objects' invention, beginning with Thorndike's problem boxes, Köller's experimental toolkit and

the experimental objects in A.N. Leontiev's scientific school, is a part of humanity's intellectual history, the history of its creative potential deployment towards self-development and self-cognition. Some of these objects after being transformed become mass-cultural objects (for example, toys). In general, these objects — psychologists' and ethologists' inventions — belong to the cultural-historical process and modern mankind's activity structures.

Let us repeat A.N. Leontiev's statement in the epigraph: "Every object made by man — from a hand tool to the modern electronic computer — embodies mankind's historical experience and at the same time also embodies the mental aptitudes moulded in this experience». One can ponder what new human experience and mental aptitudes will be embodied in subsequent inventions of such objects and how it will relate to science and, perhaps, to the arts.

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