

## Psychological Bases of Professional Multidimensionality

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**Abstract:** To demonstrate professional multidimensionality ability to combine some directions, approaches and/or to carry out at the same time different kinds of activity the expert has to possess the special competences of integrative character such as multifunctionality and multitasking, a synergy and virtual mobility, therefore, they were called multidimensional competences. The experts possessing multifunctionality and multi-tasking gradually became multidimensional. Experimental studies showed, it didn't matter in what sphere multidimensional experts worked, they achieved higher efficiency in research. The smaller part of experts reaches multifunctionality and multitasking easily, the most part does it long enough. On the basis of judgment of this fact, we formulated a research problem: what is psychological bases of professional multidimensionality formation. In the course of multifunctionality formation respondents had big difficulties in memorizing the information necessary for high-quality performance of new functional duties and during the multitasking formation difficulties in distribution of attention to some objects. So dependence of professional multidimensionality on such cognitive qualities of the personality as memory, attention and the related to it thinking was ascertained. During the experiment, we revealed that formation of professional multidimensionality takes place more successfully when memory is structured, attention is multivector and thinking is integrative and flexible. Research of dependence of professional multidimensionality on cognitive qualities of the personality allowed us to formulate the following conclusion: the psychological basis of professional multidimensionality of the expert is made by set of such intellectual qualities and abilities as structuredness and systemacity, the associative structured memory, multivectorness of attention, an integrative and flexible thinking.

**Key words:** Professional multidimensionality, multidimensional competences, multifunctionality and multitasking, virtual mobility and a synergy, structure and systemacity, the associative structured memory, multivectorness of attention, an integrative and flexible thinking

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### INTRODUCTION

Multidimensionality is the fundamental property pertain to lifeless and wildlife, including the person. In philosophy, science and religion the concept “multidimensionality of the person” was strongly approved. Questions of multidimensionality became a subject of researches in pedagogics and psychology. Personality in the multidimensional concept of Morgun (1992) is considered as actively mastering and consciously transforming the nature, society and own identity person who has a unique dynamic ratio of existential orientations, demand-willed feelings, substantial orientations and levels of mastering experience, multidimensional forms of realization of the

activity. On the basis of logical-semantic models Shteynberg (2002) developed multidimensional didactic tools, using the synergetic principles of openness, integrity and variety, Ostapenko (2007) created the theory of pedagogical reality modeling, the multidimensional model of mathematical training of the teacher was realized in dissertation research of Dorofeev (2011).

Within the research program of Nizhnekamsk office of UNESCO chair of Gertsen university since 2009, we studied pedagogical and psychological bases of professional multidimensionality (Bordovsky, 2013). We introduced into scientific turn the concepts “professional multidimensionality” and “multidimensional competences”, the content and forms of multidimensionality expression in practical work were

discovered. In various fields of activity multidimensionality is realized differently. In creative areas multidimensionality of the expert appears as ability to combine in the work some directions, approaches, technologies. As a result of integration creative people make discoveries, synthesize new materials, develop high technologies, create unique works of art, introduce the innovations promoting great breakthrough in the corresponding spheres of activity. In the routine sphere multidimensionality of the expert appears most of all as ability to carry out at the same time some kinds of activity. Due to this ability performers reach the high level of professional skill, achieve higher efficiency of work. By uniting both fields of activity, we received more general definition: professional multidimensionality is an ability of the expert to combine (to integrate) some directions (approaches) in the activity and/or to carry out at the same time some kinds of activity. To combine some directions (approaches) in professional activity or to carry out at the same time some kinds of activity the person has to possess the special abilities with an integrative basis. Abilities which provide the expert professional multidimensionality in any field of activity, we called multidimensional competences. We referred to them, first of all, such abilities as multifunctionality and multitasking, virtual mobility and synergy.

Multidimensional experts have higher level of work efficiency in various fields of activity. The experimental studies carried out in 2011-2014 showed that multidimensional experts achieved higher efficiency in whatever sphere they worked. In our experiments as representatives of the creative sphere the teachers of comprehensive schools of Nizhnekamsk took part and as representatives of the routine sphere were Nizhnekamsk bus drivers of JSC. After generalizing results of experimental studies we came to a conclusion that professional multidimensionality acts as a universal form of increase of work efficiency, use of multidimensional competences in any field of activity leads to the economic effects expressed as productivity gains, increase of added value. Experts reach multidimensional competences gradually in the course of professional self-development. Extent of mastering professional multidimensionality first of all depends on a level of development of cognitive abilities of the person. This research was conducted for studying dependence of professional multidimensionality of the expert on his cognitive qualities and abilities.

## **MATERIALS AND METHODS**

**Main part:** Professional multidimensionality of the expert is formed gradually, during development of memory, attention and thinking. By forming experiment, we came to

understanding that the process of mastering professional multidimensionality is more successful when the expert's memory becomes more structured, attention multivector and thinking integrative and flexible. Let's show a place and a role of each of them in formation of professional multidimensionality.

**Associative structured memory:** The structured information forms a certain steady set and is imprinted in certain centers of memory. In case of need the information which is actual for the present time, is selectively reproduced. After repeated reproduction information from random access memory is transferred to long-term memory. Here all information is stored in the form of associated. The more associations contextual with professional activity will be established between information needed to be kept in mind and material already known to the person, the longer, it will remain in memory and will easier be remembered at the right time. Contextual reminders promote recall of all set of the structured information. Such memorized information, actual for multidimensional activity will be quickly and accurately reproduced. Contextual associations and contextual reminders provide the reliable mechanism of memorization and reproduction of the structured information. On the basis of results of the experimental research directed on studying a role of the contextual associations and reminders done by such scientists as Cook *et al.* (2013), we came to the conclusion about necessity to introduce into scientific turn the concept "the associative structured memory". So, the associative structured memory represents the most effective way of memorization and reproduction of the structured information with use of contextual associations and keywords. The associative structured memory is directed on creation on each subsystem the complete phenomenon or process of the structured information necessary for mastering professional multidimensionality.

**Multivector attention:** In high school textbooks on psychology definition of such contents is rather widespread. The attention is an ability of the person to concentrate on any object and it appears in selective perception of it ignoring other objects. Here, it is only about one type of attention, one-vector, i.e., about the attention focused on one object. For simultaneous performance of several kinds of activity abilities of the person to perceive one or several objects in ensemble with other objects have to be developed. For this purpose the attention has to be multivector, i.e., directed at the same time on some objects. At simultaneous perception of several objects as show Bulatova and Utochkin (2013) perception of individual object is distorted. These can

explain that fact that most of people are incapable to watch at the same time TV and to read the book to talk and solve a problem to play a musical instrument and to listen to radio. The flow of information which arrives from various sources is processed by the central nervous system of the person. According to Donald Broadbent the central nervous system represents the channel of transfer of information with a limited capacity. This channel according to Broadbent is capable to transfer limited amount of information, about 10 bits a second. Therefore possibilities of the person to distribute attention to bigger number of objects are limited. Excess of this limit leads to sudden increase of the number of mistakes (Broadbent, 1982).

Chikzentmihalyi (1990) considers attention as the limited tank of mental energy. No work without attention can be done. At work mental energy is dissipated, at simultaneous performance of two kinds of activity the expense of mental energy considerably increases. Energy is dissipated for maintenance in tense condition two centers of a brain and also for ensuring continuous interaction between them. Daniel Kahneman considers attention as the intellectual effort possessing a limited resource. Limitation of intellectual effort is shown in situations of simultaneous performance of two or more kinds of activity. In the conditions of time shortage, the much bigger effort is spent for operations of a choice and decision-making. Provide with intellectual effort one of two kinds of activity carried out at the same time can be stopped if total energy exceeds a limit of admissible power. Therefore at high workload the distributed attention transfers into one-vector (Kahneman, 1973). The sum of the efforts spent for performance of difficult activity gradually decreases in the process of training and acquisition of necessary skills. It is connected with automation of attention. Shiffrin and Schneider (1977) on empirical material proved the fact of automation of attention as the main effect of learning. By automation of search processes the volume of intellectual effort decreases and there is a certain stock of power for the distributed attention, i.e., conducting additional activity. For example, each driver felt that at initial stage of driving the huge energy necessary for distribution of attention to some objects is spent. In course of automation of the driving processes the energy expended for car driving decrease, the driver has a certain stock of attention for making additional functions (Kaymanov, 2012).

**Integrative thinking:** The integrative thinking on Morgun unites in itself all functions of thinking and logical operations: induction and deduction, abstraction and reflection, structuring and systematization, analysis and

generalization, etc. (Ostapenko, 2007). The integrativeness is an ability of the expert to combine in the course of activity abstract-logical and art-figurative thinking types. The integrativeness is the most important characteristic of multidimensional people. The integrative thinking is aimed at providing synthesis of information streams from both cerebral hemispheres for development of the verified decisions. For formation of integrative thinking, it is necessary to involve into work at the same time both cerebral hemispheres. Such intellectual qualities as rationality and logicity, ability to establish causal connections, to perceive separate details of subjects and the phenomena, to analyze and to structure are connected with work of the left hemisphere (abstract-logical thinking). Intellectual qualities of opposite sense are connected with right hemisphere thinking (art-figurative thinking): irrationality, illogicalness, ability to perceive subjects and the phenomena completely, ability to act intuitively, to listen to an internal voice, to follow the images created by imagination. The combination of two types of thinking left hemisphere and right hemisphere-forms integrative thinking in which the logic is supported by intuition and vice versa. In the most critical situations when the left hemisphere thinking does not find the decision, the right hemisphere joins: the intuition works. Based on the saved-up experience having analyzed the situation, the brain gives the most optimum decision.

**Flexibility of thinking:** The multidimensional expert must have not only an integrative but also a flexible thinking. Flexibility of thinking is an ability quickly to switch to a new type of intellectual activity. A combination of an integrativeness and flexibility of thinking is an indispensable condition of multidimensionality. Flexibility of thinking is aimed at providing necessary proceeding speed of mental processes for implementation of professional multidimensionality.

Flexibility of thinking depends on mobility of attention and speed of recovery of information. Mobility of attention is in turn characterized by a lag effect and accommodation. The lag effect of attention is estimated by time of its separation from the previous object. Accommodation is measured by time of its focusing on a new object or a kind of activity. Speed of information recovery is defined by the volume of the restored information in unit of time. As we already know, the attention better “links” the structured information and memory quicker restores information which is written down by use of contextual associations, bright images. The knowledge of these features allows the person to train the memory and attention. Using special devices it is

possible to calculate quantitative values of the parameters characterizing flexibility of thinking. Therefore the expert, systematically working on development of the memory and attention is capable to reach flexibility of thinking which is necessary for showing professional multidimensionality.

**RESULTS AND DISCUSSION**

On the basis of research about dependence of professional multidimensionality on personal qualities and abilities of the person, we received the following results.

- The psychological basis of professional multidimensionality is made by set of such qualities and abilities of the personality as structuredness and systemacity, the associatively structured memory and a multivectorness of attention, an integrativeness and flexibility of thinking, each of which has a certain focus:
  - Structuredness of memory is aimed at providing quantity of parts (subsystems), sufficient for manifestation of multidimensionality
  - The associatively structured memory on creation the set of the structured information on each subsystem
  - Multivectorness of attention on implementation of continuous information exchange between subsystems and the centers of a brain corresponding to them
  - Systemacity on establishment of interrelations between parts of complete process on the one hand and with external factors on the other
  - Integrativeness of thinking on ensuring synthesis of information streams for development of multidimensional decisions

- Flexibility of thinking on ensuring the speed of passing of mental processes necessary for manifestation of multidimensionality (Table 1)
- Use of professional multidimensionality, i.e., a combination of several directions and approaches, simultaneous performance of several kinds of activity, demands from the person considerable psychopower expenses, connected:
  - With creation and maintenance in an active condition several centers of the structured memory and providing continuous information exchange between these centers of a cerebral cortex
  - With formation and functioning of the multivector attention distributed on some objects
  - With functioning of the integrative thinking ensuring simultaneous functioning of both brain hemispheres
  - With maintenance of thinking flexibility at the level sufficient for multidimensionality manifestation
- Psychopower expenses of the multidimensional expert as a rule pay off economically as manifestation of multidimensionality increases added cost which is reached:
  - By multifunctionality by means of the growth in labour productivity connected by reduction of the combined positions
  - By multitasking by means of the increase in volume of production due to the simultaneous solution of several accompanying tasks
  - By virtual mobility due to the reduction of time and resources connected with replacement of physical communications on virtual

Table 1: Intellectual Qualities and Abilities (IQA) of the multidimensional personality

Name of IQA	Content of IQA	Direction of IQA
Structuredness	Ability to break the phenomena and processes, including activity, on components (subsystems) on the bases actual for multidimensionality manifestation	Allocation of the necessary for the multidimensionality manifestation number of parts (subsystems) of the whole activity process
Associative structured memory	Method of memorizing and reproduction of the structured information by use of associations and keywords	Creation on each subsystem of the own complete structured information necessary for manifestation of professional multidimensionality
Multivectorness of attention	Ability to distribute attention to some directions (objects) of activity	Implementation of continuous information exchange between several centers of a brain and the respective directions (objects) of activity
Systemacity	Ability to consider the phenomena and processes completely as result of interaction/influence of internal and external forces	Implementation of interrelation between parts (subsystems) on the basis of the structured information and interdisciplinary knowledge of complete process
Integrativeness	Ability to combine abstract-logical and art-figurative thinking types	Ensuring synthesis of information streams from both cerebral hemispheres for development of multidimensional decisions
Flexibility of thinking	Ability quickly to switch to a new type of intellectual activity	Ensuring necessary proceeding speed of mental processes for implementation of professional multidimensionality

- By a synergy due to the synergetic effect corresponding to higher level of self-organization

### CONCLUSION

Success of mastering professional multidimensionality depends on ability of the expert to distribute attention on flexibility and an integrativeness of thinking, on a level of development of the associative structured memory. By purposeful development of memory, attention and thinking, experts can become multidimensional. Multidimensional experts differ in higher level of efficiency of professional activity. In the routine sphere, they reach higher efficiency of work due to multitasking and multifunctionality which are based on structure of memory, systemacity of thinking. In creative spheres of professional activity experts achieve higher efficiency due to multitasking and multifunctionality, virtual mobility and a synergy based on flexibility and an integrativeness of thinking, multivectoriness of attention.

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