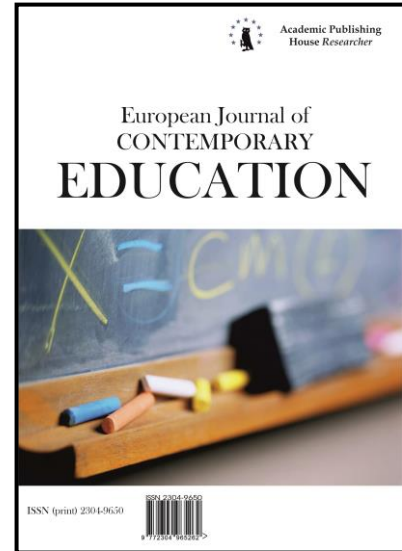




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## **Methodological Guidelines for Defining a Complex Psycho-Pedagogical Concept: A Case of the Definition of the Research Capacity of a Teacher in the Vocational Education System**

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### **Abstract**

The historical landscape of science reminds us that researchers have always faced the challenge of defining the subject matter of the object of inquiry. If we expand the map of our journey across the fields yielding scientific knowledge, we will discover a largely similar picture. It is quite obvious that the definition design objective will always remain relevant for researchers. The authors of many works see the main value of any definition in its Capacity to deliver two objectives: to tag the category of objects of a certain type; to highlight the object's essential attributes that reveal its specific subject matter. Realization of these objectives results in the assignment of the object's basic taxonomic rank with the methodological reference signifiers that include, on the one hand, the coherent integrity of the object's intrinsic attributes, and, on the other hand, the object's specifically discrete features. Alongside, there arise methodological difficulties directly related to the justification of the logic and procedures for determining the object's essential attributes and their reflection in the definition of the subject matter. This article is an attempt to expand the methodological scope of the psycho-pedagogical paradigm for definition design through the study of the concept of the Research Capacity of a Teacher in the Vocational Education System. The definition design methodology is presented hereby as a correlation of descriptive, explanatory, and concept models of a given phenomenon and as a consistent transition from one information structure to another. This process results in the assembly of the semantic construct for the definition, which allows to expand it through the synergy of integral features.

**Keywords:** psycho-pedagogical concept, definition design methodology, research capacity, descriptive model, explanatory model, concept model, integral features, definition concepts.

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## **1. Introduction**

Definition design has always been and will remain a challenge for researchers. It is approached differently for different types of a definition. An intentional definition, for example, involves the description of qualities and features of an object that attribute it to all allies in the class to which it refers; explanation of the connotation of the term; the indication of the distinguishing features of the object and the most relevant concept (Cook, 2009). In the case of an implicit definition, it is substituted with a designed context or a set of certain axioms (Opredelenie (logika) et al.). In the case of an explicit definition, some distinct attribute of the (real or abstract) object helps to distinguish it from the allied objects (Logika dlya menedzherov, 2019).

Despite the variety of approaches to definition design, they usually come down to two objectives: 1) to tag the category of objects of a certain type; 2) to highlight the essential attributes of the object that reveal its specific subject matter (Opredelenie (logika)). In particular, these very objectives prominently validate the most extensive use of the basic taxonomic ranking, including attribution of the given concept to the most relevant genus and the subsequent detailed study of its differentia. Researchers acknowledge the challenging nature of the latter objective since the study of the objects' essential attributes takes a long comprehensive scientific inquiry (Ruzavin, 1997).

There is yet another eventual complication that is worth mentioning here. It occurs virtually at all stages of the definition design. It occurs even when the main attributes of the object are detected and studied sufficiently well. This obstacle is methodological in nature because it is directly related to the rationale behind the logic and procedures for selecting the essential attributes and their subsequent inclusion into the content of the definition. Indeed, if we consider the modalities of the definition design, we will have to agree that many of them are arranged as sets of vaguely linked operations. They do not actually reflect on the process of transition from one information structure to another, they do not explain how exactly this can be done, within which framework of parameters, and in which sequence. And most importantly, they do not explain why it should be done this or that way, and not otherwise.

How, for example, can the object's attributes or distinguishing features be described without any advance input about the baseline criteria and necessary procedures for displaying the initial information about the object in the structure of the definition? Or, what is the distinguishing feature by which a real or abstract object is supposed to be distinguished from a multitude of allied objects? In particular, what level of meaningful generalization corresponds to the explicative function of a distinctive feature in the case of a real definition? There are also questions about the reasons for recommendations to substitute an implicit definition with a context or a set of axioms (Opredelenie (logika)). Is it really sufficient to merely present axioms as compactly and conveniently as possible for further use? Or, should not we rather, with reference to the given object, somehow work out in advance, the logic-and-content framework for the definition design, the functions and essence of such axioms, and the requirements for their selection?

Some additional efforts are obviously needed to explore the methodological background for the logic and the standard procedures that would be appropriate in designing definitions of a particular type. This article discusses such challenges and outlines the methodology for overcoming them. As a relevant exercise in methodological guidelines, let us consider the case of the taxonomic definition of the Research Capacity of a Teacher in the Vocational Education System.

## **2. Methodology**

The methodology is based on phenomenological, system, and integrative approaches and is oriented towards designing a concept definition for the psycho-pedagogical concept through the consistent deployment of the three interrelated models: the descriptive, explanatory, and concept models. The phenomenological approach meets the objective of finding the basis for a comprehensive description of the given phenomenon. The system approach is used to generalize the system-specific attributes of the psycho-pedagogical phenomenon and to define their content.

By means of the integrative approach, the binary correlations of the system's functional variables are set, thus creating the grounds for identifying the integral attributes of the phenomenon in order to build its explanatory model. The transition from an explanatory model to a concept model, as well as the conceptual interpretation of the phenomenon, are carried out by reducing the integral attributes to some key concepts in the target definition.

### **3. Discussion and results**

Once we consider a definition as a set of data reflecting the subject matter of the phenomenon, the design of the definition of a Teacher's Research Capacity seems quite clear and easy: it is necessary to obtain information about the attributes of the Capacity and transform this information into a definition. However, a closer look at the situation makes it somewhat more complicated. In particular, it is necessary to detect the attributes that would help to describe the Capacity as a comprehensive phenomenon of a certain type; detect some features that would allow the generalized expression of the essential attributes of the Capacity; the concept framework of the Capacity, and, finally, the design construct of the target definition.

As a result, the methodological scheme for designing the definition takes the form of a step-by-step modeling of a defined phenomenon, as the information about the Research Capacity undergoes a sequence of structuring and generalization transformations: a descriptive model – an explanatory model – a concept model – the definition concept.

The definition design begins with a general description of the phenomenon without its details. For this purpose, a descriptive model of the phenomenon is constructed, which states its invariant value, in other words, its register within the boundaries of a class of similar phenomena. In this sense, the descriptive model is a logical framework of abstract concepts that together denote what the given phenomenon essentially is. In our case, this class of phenomena is represented by a Teacher's Research Capacity. This class of phenomena includes the Teachers' Research Capacity in the framework of Higher Education, Secondary Vocational Education (VET), General Education, Further Vocational Education, etc.

The description of a phenomenon can be carried out in different projections, but the projections must meet the objectives of highlighting the three consistent attributes that are necessary for its comprehensive presentation.

In our view, the phenomenology of the Research Capacity includes at least three components: 1) the general conception of the Research Capacity (the mental image of the Capacity ); 2) the attitude towards the object, process, and result of the Capacity realization; 3) the right conditions for the Capacity realization and self-development. Therefore, the Research Capacity as a comprehensive phenomenon should be analyzed in terms of the following three projections: substantiality, intentionality, and situationality.

The substantial projection allows us to consider the Research Capacity as the structural and functional conception of human cognitive capabilities. The Capacity description is performed in terms of the attributes that are invariant within this class of phenomena.

Intentionality is understood as the attribution of some meaning to some activity which expresses the object orientation, its attitude towards the ongoing process, and the result achieved. That is why in terms of the Intentional projection, the Research Capacity manifests itself as a system of axiological relations to the object, process, and result of research activities.

The situational projection makes it possible to record the variability in the functioning of the Research Capacity in a particular situation.

With reference to the given projections, the descriptive model includes attributes of three types: substantial (system, objectives, abilities, structure, forms, mechanisms, processes, results); intentional (orientation, meaning, attitudes, roles, functions); situational (situations, types of activities, determinants, regulators, degree of distinction).

The next important step in the design of the definition of a Teacher's Research Capacity is the transition from individual attributes of the phenomenon to integral features. It should be noted that, despite a certain degree of systematization of the attributes and a comprehensive mapping of the Research Capacity, the descriptive model is not structurally rigorous, which to some extent blurs the perception of the phenomenon. The fact is that the descriptive model, as it has already been noted above, is built in different projections and therefore includes heterogeneous data that is subject to different types of logic. In this situation, integral attributes must be used in order to continue the analysis and definition design of the Capacity.

The heuristic value of the integral attributes is that they allow to expand the study of the Capacity for the sake of gaining insights into its subject matter, main vectors, and features of its development under the specific conditions required for its practical realization. In order to blend the attributes, thus growing them bigger and integrated, there is a need to build among them some functional interrelationship and thus make them the object of interrelated study. It is important to

emphasize that functional dependencies are not the features of the phenomenon in question. They are binary forms of inter-relation of the system attributes as functional variables that only create prerequisites for identifying the integral attributes of the phenomenon.

The integral attributes acquired through generalization make it possible to construct a logic-and-semantic framework or the otherwise called explanatory model of the Research Capacity. In general, the explanatory model acts as a strategy for the semantic interpretation of the Capacity in its functional sense. In our case, the semantic interpretation of the Capacity is carried out in terms of functional manifestations and features of the practical realization of the Teacher's Capacity in the framework of the VET.

Thus, in order to build an explanatory model, it is necessary to identify the functional dependencies that draw the main vectors for the Capacity analysis and link the key attributes of the descriptive model. In our opinion, the functional dependencies may be as follows:

- system – objectives;
- resources – results;
- function – abilities;
- structure – determinants;
- focus – roles.

Let us consider the functional dependencies in terms of their meanings.

The functional dependence <system – objectives>. The Research Capacity manifests itself in activities that are driven by human needs and aimed at achieving certain goals, becomes a form and a result of the realization of cognitive abilities. The focus of this functional dependence is on establishing relationships and mutual influences between the system and the objectives it faces: what type of objectives are achieved in the process of realizing the Research Capacity? What kind of system of abilities provides for the achievement of objectives of this type?

The Research Capacity is primarily aimed at solving research problems. These are a special type of objectives which, firstly, are of a challenging nature, which involves searching for and processing the necessary information under conditions of its shortage or excess. Secondly, they are a link between the two fundamentally different realities – the realm of the research, and the realm of the functioning of the object (subject matter) of the research activities. Thirdly, they connect these realities as a means and a target in diverse situations (Tyunnikov, 2017).

This allows us to name the main objectives, the achievement of which will determine the level and effectiveness of the Research Capacity:

- the search for and processing of the source information on a given problem;
- detection of functional and structural dependencies in the object/environment relations system;
- identification of development trends in the object of scientific inquiry;
- structural and functional prototyping of the object of scientific inquiry;
- concept modeling of a new object;
- forecasting of the process and the object development outcomes;
- development of criteria to assess the efficiency of the object's performance;
- development of baseline parameters and objects' categorization by them in a given subject area;
- systems planning of the research work;
- organizational design of the research work;
- methodological substantiation of experimental work;
- self-development of competencies in research activities.

Even with a superficial examination of the subject matter of the Capacity, it is clear that well-pronounced research abilities are needed to solve research problems. And if the Research Capacity is perceived not only as personal psychological features of an individual but also as a way of mastering and transforming the reality, then the definition of the Research Capacity correlates with the notion of a research Capacity system. The system of Research Capacities, with its internal subject matter, expresses the syncretic nature of the Capacity and ensures the self-organization of a person by including him/her in the process of setting and solving research objectives, the process of purposeful mastering of various cognitive structures (activities, methods, principles, and algorithms).

Let us emphasize that we do not imply here a local ability or even individual abilities, but rather their system in its integrity alone. It is the system of research aptitudes that serves as the only objective condition for the productive performance of the Research Capacity; only the system can correspond to the given type of objectives and achieve the set goals in a specific way.

Functional relationship <resources – results> expresses the relationship between the resources of a productive activity, its process, and the results achieved. Any Capacity is, above all, a specific mix of resources that define the qualitative and quantitative indicators of the activities performed by a person. Like any other human capacity, the Research and Development Capacity is provided for by the existing capabilities (sources, means, strength, power) that an individual can use in a certain amount for the implementation of some plan or objective (Bol'shaya sovetskaya entsiklopediya; Lubart, Barbot, 2013; Mitrakhovich, 2008; Puttick, 2004 et al.).

Almost all definitions of the Capacity emphasize one main feature – the resourcefulness. At the same time, a significant amount of clarification is required. Since we are dealing with the Research abilities, the resourcefulness of the Research Capacity should be assessed primarily in terms of the productivity of the search for and processing of information implying research methods and principles, i.e. in terms of solving a certain class of objectives, as mentioned earlier, and achieving the planned results.

Thus, by analyzing and evaluating an individual resource of the Research Capacity, we are dealing with variables that, on the one hand, reveal a person's Research abilities, and, on the other hand, determine the productivity of the research activity as a measure of the individual performance of that resource.

The function dependence <function – abilities > establishes the relationship between the Research Capacity functions and the research abilities that allow the realization of these functions. The importance of this type of dependence for understanding the nature of abilities has been observed by psychologists (Kiely, Kim, 2014; Teplov, 1985; Shadrikov, 2010 et al.).

Of course, the functions of the Research Capacity are directly linked to research activities. One might say that the Capacity is 'specialized' in research objectives. And, obviously, it is in its special area that the functions of the Capacity are realized first and foremost. Meanwhile, the area of its productive self-realization is much wider. Research abilities also play a significant role in other activities in such areas as innovation, forecasting, design, organizational, diagnostic, technological, and other fields. That is why we believe that the Research Capacity realizes itself as a multifunctional system in different types, forms, conditions, and modes of operation.

In a first approximation, the main functions of the Research Capacity include the following ones: synthesis, recognition, evaluation, logistics, transformation, prediction, testing, control and correction, and self-education.

In the professional sphere, a Teacher's Research Capacity manifests itself primarily in the productive self-realization of educational, research, and innovation activities and has a significant impact on virtually all stages of the development, integration, and practical application of research structures in vocational education.

Functional dependence <structure – determinants>. The correlation of the available resource of research abilities with the productivity of research and other activities depends on various determinants. It is impossible to imagine the Capacity as a once launched and invariably operating mechanism. The effectiveness of the realization of the Capacity in practice depends on the extent and manner in which an individual's research abilities are triggered. Whatever the situation, an individual's abilities are subject to the influence of internal and external factors, which may vary both by their composition and the power of the impact. As a result of these influences, the structure of the Capacity changes, in other words, it becomes somewhat fluid.

Indeed, in some situations, mobilization of research abilities is more comprehensive and successful, and the performance of the activities is higher; in others, the productivity of the activities is lower and less successful. The transformation of the Research Capacity can take place in a number of ways, from a complete development of the structure to a complete blockage by the factors involved. However, the structure of the Capacity may change dynamically both in preparation for the objective and in the process of achieving it.

In terms of internal factors, it is important to emphasize that the Research Capacity is realized in a system of other Capacities (personal, creative, professional, etc.), which ultimately affects the effectiveness of the activities carried out. For example, the status and level of the

Research Capacity depend to a large extent on self-actualization, concentration of will, moral responsibility, a sense of self-esteem, personal qualities such as independence, perseverance, organization, communication skills, and others. This presupposes that the structure of research abilities is directly based on the personal Capacity, its mental and psychological structure.

It should be noted that, in essence, it is in this context that many aspects of the problem of self-realization of a modern individual in a dynamically developing living environment are discussed. In a similar context, psychologists consider the personal meaning attributed to a situation when a person is able to perceive difficulties as some opportunities for productive self-accomplishment (Verbitsky, Ilyazova, 2011; Sieck, 2020). In this regard, the conceptual idea of the 'boost for creative output' proposed by R. Sternberg and his colleagues is interesting (Sternberg, Kaufman, 2018).

As for the external factors that determine the mobilization of human research abilities, we should note, above all, the impacts of material support, physical environment, information, and communication environment. In this respect, researchers emphasize the role of factors and parameters of the environment which prompt a human's self-accomplishment and development (Lubart, Barbot, 2013; Mitrakhovich, 2008; Sachs, 2005 et al.).

Functional dependence <orientation – roles>. At this point of the methodological analysis, we deal with the question of the mutual dependence of the Capacity focus on a particular area of practice and the functional roles typical of these areas. This relationship is fundamental to many professional objectives since it provides a relatively stable structure for research activities, including the following elements: objectives, means, roles, and functions that are currently relevant for a particular activity.

It is important to stress out that in this case the practical orientation of the Capacity is only seen from the perspective of those functional roles of the individual which effectiveness in the process of active and targeted action depends on the internal resources of the research activity.

L.I. Abalkin points to the need for the Capacity specification, believing that the Capacity, irrespective of its genus and species, is a 'generalized, collective resource attribute tied to the place and time' (Abalkin, 1987). Therewith, it should be noted that the Research Capacity acquires some subjective certainty in the real time-and-place relationship by being integrated into an activity with a specific set of regulated functions and roles. This integrated attributes of the Research Capacity indicate the professional functions and roles of the employee who owns this the Capacity and is its holder. In the VET system, these are administration staff of educational establishments, teachers of social and humanitarian disciplines, general professional and special disciplines, teachers of vocational training, curriculum developers, and supervisors. The definition elements for the Capacity, the source of which is the professional activity, suggest consideration of the features of the function-and-role integration of a particular employee in the system of professional activity.

The analysis of functional dependencies makes it possible to form an explanatory model of the Capacity, which includes the mutually complementary integrative attributes of Systematicity, Resource Productivity, Multi-Functionality, Structural Mobility, Function-Role Determinancy.

As we have explored the logic-and-semantic definition of the Capacity at large, we can move on to a concept model. The concept model is a set of concepts. Each individual concept contains a statement regarding the attributes and functional features of the Capacity. To form the necessary set of statements, the integral attributes of the Capacity are transformed into complementary concepts. While establishing a meaningful correspondence between the integral attributes of the phenomenon and the concepts, we should follow the following basic requirements: Identification, Differentiation, Specification, Generalization.

Identification: the concepts included in the concept model make it possible to recognize the Research Capacity as a comprehensive phenomenon allied with similar phenomena.

Differentiation: the concepts of the concept model make it possible to identify the following constituent parts of the Capacity: types, forms, mechanisms, modes of manifestation.

Specification: the concepts of the concept model reflect the following specific features of the Capacity: directions, areas of application, function-and-role content.

Generalization: the concepts reflect the main common aspects in its class.

With these requirements in mind, a concept model of the Research Capacity can be designed as a set of the following elements:

- the Research Capacity is a system of research abilities (the integral attribute is the Systematicity)
  - the Research Capacity has an individual degree of distinction (the integral attribute is the Resource Productivity)
  - the Research Capacity is a multi-functional system of research abilities compatible with various activities (the integral attribute is Multi-Functionality)
  - the Research Capacity is a system with a deterministic structure (the integral attribute is the Structural Flexibility)
  - the practical orientation of the Research Capacity is influenced by the functional and role-specific features of professional activity (the integral attribute is the Functional and Role-Specific Certainty).

The final step in the definition design involves the final arrangement of concepts. Different modifications of the definition design are possible, which does not override the basic rules for the text design of a definition: balance, lack of tautology, clarity, and lack of negation (Logika dlya menedzherov, 2019); definitions need to be applicable in the broadest sense, establish definition-related links with other terms, and draw attention to the analytically important aspects of the object (Oppenheim, 1975).

So, to conclude the discussion of the hereby approach, may we suggest the following definition: *the Research Capacity of a Teacher in the Vocational Education System* is a multi-functional system of research abilities with a flexible structure and an individual degree of distinction of mechanisms and processes of productive self-realization, development, integration and practical application of cognitive structures of various activities of a Teacher involved in the vocational education system.

#### 4. Conclusion

A distinctive feature of this definition is that it is the result of processing and sequential consolidation of information about the given phenomenon within a step-by-step definition design process. The fact that in the stepwise modeling the attributes of the phenomena and the relationships between them acquire some degree of completeness and an integrative meaning, testifies, in our opinion, to the enhanced wholeness and adequacy of the target definition. It is important to note the heuristic nature of this approach, as well as the possibility of its extrapolation, if not for the entire, yet for a fairly wide range of psycho-pedagogical concepts.

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