GENERAL THEORY OF DIVERSITIES AS ONE OF THE MOST IMPORTANT PARTS OF THE UNIVERSAL CURRICULUM CORE

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Creation of a convenient and user-friendly scientific terminology is discussed. Special attention is given to creation of scientific terminology in the field of natural Sciences. Such terminology should be understandable not only in Russian literature but also in the language of international scientific communication. The main causes of difficulties in translation of scientific terms from Russian into English and Vice versa are discussed. Several terminological problems associated with the concept of information and concepts that describe the pedagogical process are studied in details. Authors provide a number of practical recommendations and clarifying assumptions.

Keywords: Commmunication, competency, context, information, matter, perseption, semantic meaning, substance

Knowledge, which an educated person should have, consists of *Universal Curriculum Core* or *UCC* and an actively developed shell. It consists of a series of content specific areas [1]. UCC has a central core with *Primitive Knowledge*. A layer with *Basic Knowledge* is located around it. The set of fundamental Laws of Nature and Humankind are one of the most important parts of this knowledge layer. Updates of the data collected in the layer of Basic Knowledge go much slower than in the areas of content specific information. These updates do not run evenly. At this point of time the update of the laws describing diversities of Nature is one of the relevant problems in building modern instructional technologies. The brief discussion devoted to the selection of the most important laws of diversities in order to include them in modern UCC is a goal of this issue.

The starting point in learning the Science of diversities is a well known fact that the Universe is not homogeneous. Its parts can be called *Objects*. They are in constant interactions with each other. It is possible to call them all *Essences.* Each Object has definite dimensions. They can also exist at any interval of time. Ideal chaos without beginning, and fixed end, and without definite dimensions is only an ideal imagination, which cannot be realized. Therefore, a good philosophy must study models of the Universe or its parts, which can be described in terms of their deviations from ideal imagination [2]. People's orientation in the world requires comparing properties of different matters. This forces a person to search for matters with similar or equal properties. The entire human behavior essentially relies on the assumption about the possibility of intelligent reactions, which are the same under the same conditions. It is intuitively clear that the same conditions may be provided by the sameness of matters. The properties of each of them depend on the way of measuring its value. If one wants to estimate any property numerically he (she) must have a matter which possesses this property, also. Then it is possible to compare these properties. Obviously, one must have additional matter, which is used for comparison. The first conclusion from this analysis is the following approval:

To have any numerical estimation of any matter it is necessary to have no less than three independent matters.

What does it mean when we say that two entities are fully identical? It is possible only when a set of all possible properties of these matters, both numeric and qualitative are exactly the same. From the ancient times it is known that if two matters **A** and **B** have so called *Strict numerical identity***,** all their properties must be the same. It is written in [3] ***Leibniz's Law*:**

If A is one and the same thing as B (that is, A is numerically identical to B), then every property that A has, B also has to have, and vice versa [4].

The main conclusion from this is the following ***Statement***:

In nature there are never two beings which are perfectly alike. As a result, it is possible to say: *Two objects (things, goods and even a number of actions) can never be fully identical.* Soma time one says that they are *Partial identical.*

Each object changes in time. The ordinary needs of a human never require strict identity of objects and situations associated with his (her) life. Therefore, since their birth, all people subconsciously divide all objects and events based on less stringent requirements, than full identity. The brains of the higher animals, such as humans, selectively pick up all

features or properties of objects and events and divide them into two main parts. The properties of one of these parts remain constant or invariant over time, in size, and through several transformations of the object (process). The second part of the features (properties) may vary within wide limits. It is hardly possible to predict in advance how to divide all features (properties) into these two independent parts. The result of this procedure depends on several factors. One of them is strongly tied to the senses of biological species. The other is connected with the environment or, more generally, the context in which the object, or set of actions are perceived. The group of invariant features (properties) is obviously less than the full list of these items. As a result of its incompleteness, the list of invariant properties can be the same for various objects. The difference between these objects is tied to a set of non-variant properties. All objects or processes with the same set of invariant features (properties) in a certain range of requirements can be considered as being similar. In real life, the requirements for matching the properties are less stringent. Therefore, in reality, the groups of objects (goods, materials, processes), which consumers treat as similar can be large. For practical purposes, all these objects and processes are usually treated as similar. All objects or processes which are gathered in such groups are defined as *Sameness Objects*. They are the real replacement of ideal representation of identical objects.

Namely, sameness objects are the targets of everyday human activity. Even a rough estimation of the number of various entities, which are interesting to mankind, is an impossible task. However, there is every reason to believe, that this variety is operated by certain General Laws. This realization did not come immediately. However, there is every reason to believe, that this variety is operated by certain General Laws. They are the body of *General Theory of Diversities.*

Theory of diversities: Brief historical overview

Benedict Spinoza was probably the first, who after the ancient times pronounced the main idea of General Ideas of Diversities [3]. He said:

Nature is always the same, and its virtue and power of acting are everywhere one and the same, that is, the laws and rules of Nature, according to which all things happen, and from one to another, are always and everywhere the same. So, the way of understanding the nature of everything, of whatever kind, must also be the same, namely, through the universal laws and rules of Nature.

Its development in subsequent years was mainly focused on the items of Natural Philosophy. Over time, it became apparent, that the same laws must operate in the field of humanitarian knowledge too. This was clearly reflected in the words of the famous German poet and philosopher Friedrich Schiller. He wrote that human brains require consistency of rules and the nature in opposite to this free variety. Therefore, people should take into account both of these requirements [5].

Subsequently, for almost two centuries scientists and philosophers repeatedly returned to the discussion of this problem. One of the best descriptions of it was given in [6]. Ita authore was the first who suggested the name *Diatropics* for the science, that describes the General Laws of Diversities. This term is still not widely used, because this book was never translated into other languages. A number of investigations in this field was discussed in [6]. The results accumulated over the subsequent twenty years require a new understanding. People need the development of new curricula, which would incorporate the most important recent achievements. An attempt to enumerate problems, which must be known by each educated person, will be discussed further.

Various models of diversity

The Universe is a complex system, and its behaviors may be known only partially. Its perception by humans is possible as a result of modelling. One who defines modelling as a simplified description takes into account only some of the properties. The loss of a number of important properties in the description of Nature is the cost for simplification of studied problems. Depending on a situation a person picks various properties in a simulated system for selection of matters. As a result the plurality of the same matters is possible, for groups together and classified in several different systems. We define each of these systems as *Specific Diversity.* So, the plethora of the same matters may be represented with a set of different diversities. It means that the formation of diversity depends on understanding of human problems. For various situations the set of selected matters and their order in the developed diversity can change. It means that the grouping of matters in diversity depends on the objective properties of the environment and subjective reflections of these properties in the human brains. Depending on the ratio of these

circumstances one can talk about *Native* and *Synthetic* types of diversities [7]. The Various trees like oaks, pins, et cetera are an example of matters in the Native Diversity called Forest. Road signs are an example of Synthetic Diversity. The instance of atoms in the periodic system is an example of diversity which is built on Native Base, but with the strong effect of human understanding. It is a Synthetic System. If desired, it can be considered to be an intermediate type of diversity that may be called *Artificial Diversity*. Trams, buses, cars and other types of municipal and private transportation create another type of intermediate diversity, which is possible to define as *Man-made Diversity.*

Each matter of Nature is a part of or an Object of various diversities. For instance: men's trousers are a part of such diversities as clothing or military uniforms. Items in a store or factory products are a few of them. In each of these different diversities, various properties of one and the same matter appear. The *Completeness* of a matter description includes all possible properties, which humans can know about. This means, that:

A full description of each matter in the Universe is the Diversity of all Diversities in each the matter is a part [7].

For simplification of this terminology Let us call the Diversity of all possible diversities: *Manifold.*

The main properties of diversities

Diversity usually collects matters with various sets of properties. Let us look at the diversity Forest. It includes trees, bushes, streams, bird nests and much more. They are united by the General system of the forest. This system allows for partial ordering. Trees and bushes can be combined into a group by the presence of their trunk. In turn, trees can be split into the groups coniferous and deciduous. Accordingly, any diversity admits partial ordering. In turn, each new grouping of matters itself can be divided into a new diversity on the basis of the other properties combining matters in the new group. This means, each variety is itself a hierarchical system. Objects at each hierarchical level of any system is diversity. Such complex Objects are frequently denoted as *Holons* [8]. According to the holoarchy concept, one says:

The horizontal structure of hierarchical systems (each of its level) appears as several subsystems named holons.

Holons have a dual nature. On the one hand, they represent a holistic alien structure of the whole system. On the other hand, they are almost independent systems of the lower level. It means, they can be divided into smaller items. One can say:

Each holon is a complex aggregate of holons of a lower level range, and at the same time it is an element or holon of a level of a higher range.

To understand the whole system of diversity it is important to pay attention to the nature of the interaction between elements of the system. These interactions exist between the elements of each level of diversity. We call them *Internal Interactions.* In addition, there are interactions between elements of different Objects, or external ones. If the interactions occur at the same level of a hierarchical system, we call them *Horizontal interactions*. The emergence in the system of the substructure is a consequence of the fact, that on the same hierarchical level, the power of internal horizontal interactions is much stronger, than the power from external horizontal interactions. In many practical situations, this permits one to study different Objects at the same diversity level as independent matters.

The General considerations, which have just been given, have been known for a long time. Moreover, it was found, that the most important properties of diversities are possible to be studied independently from the problem being analyzed. One should note that these laws are valid only as they apply to the upper levels of the diversity. The real position of this level is not strictly determined. Determining this level is the *Level of Sameness* [9]. For quite some time it has been empirically known that only the top levels of diversity hierarchy are actual development processes. It was first studied in detail by E. Sedov [10]. He called this empirical observation *The Law of Hierarchical Compensation*. (In many cases this expression is translated into English as *The Law of Requisite Variety*). Sedov's Theorem can be written as:

The growth of variety of the top level of hierarchical diversities ensured by limiting variety at the previous levels; increased variety at the lower levels destroys the top level of the diversity system.

A recent achievement, which must be included in the curriculum, should be considered for the understanding of the phenomena that explains the possibility of limiting the analysis of the properties of diversity only at its upper levels [11]. Initial analyses of the properties of diversities are actually limited by their fixation. Dynamics of processes occurring at different systemic levels of diversity in the first

approximation was not considered. It has become apparent that the nature of vertical interactions between hierarchical levels of diversity is affected by the fact that at these levels the processes occur at different speeds. At lower levels the processes are much faster than at the higher. In other words:

In the vertical interactions, average results of horizontal interactions are involved.

This statement proves the theorem by Sedov as well as similar conclusions made by other authors. The second important conclusion that one should understand is the explanation for why many General considerations about laws in complex hierarchical systems are so difficult to use for explaining social and cultural phenomena. It turns out that the time intervals used for analysis of such historical events are too small to reveal consistent trends in random processes which are always present in both vertical and horizontal interactions [11]. For instance: one knows that to find and investigate the objective laws of history it is necessary to average all data about real events over large periods of time. This period is known as *Long Term* [12].

Which main properties of diversities are necessary for inclusion in the curriculum at the tertiary level

As matters are included in the diversity, so diversity in any system is constantly evolving. The first stage in learning the theory of diversity is an explanation of conditions, which permit humans to divide the study of problems of static description of General properties of diversities and the laws of their development. The trainee must understand that this is one of the most difficult problems of learning the behaviors of Nature. This problem does not have a universal solution. An optimal instructional strategy must include the study of this problem in several basic subjects across a given period of education.

The next stage is the description of two problems. The first one is the dynamics of the origin, development, and extinction of diversities. The instructor must explain that these laws are most easily seen on technical objects or artificially created varieties of objects [7]. It is clear that for each area of future professional interests of trainees, each instructor must have various specific examples. The second main law which has to be taught from the first steps in learning the evolution of diversities is the law that:

Development of each new diversity comes from any single entity.

It may be protobacterias, primitive tools, primary investigations, et cetera. The next important basic statement is that:

Not only animated matter yet also in techniques, technology and abstract ideas the dynamic development of diversity depict the struggle between specific entities: types, technical objects, natural structures, various transformations, etc.

The next stage in the study of diversities should be familiar with the most important of their static properties. Here, the most important point to explain is the law that:

The distribution of objects in the diversity about their specific properties is uneven. A large part of objects applies to a limited number of subgroups. The other subgroups include only a few entities. As a result one can say that: All objects in each diversity are distributed unevenly.

It is described by curves of distribution. At the same time:

All possible combinations of properties are always implemented in every variety.

A very important law to be thoroughly explained to students, that it is necessary to consider the statement that:

The object of the diversity at the structural level is always built from the full set of elements of a diversity subsystem at the next level.

The last stage of understanding the problem of diversities is the analysis of specific diversities, connected with future professional interests of students. Our experience says that analysis of content specific diversities creates students' understanding in close connection between the General theory of diversities and the Theory and practice of classification systems. All of the proposed system descriptions in the end come down to facet (tabular) descriptions. The mentioned above is the objective laws of human reflection properties of diversities.

It is also necessary to explain to students that the complexity of any diversity, or its Objects is directly connected to their sustainability. The main rule here is:

The more complex is the structure of any diversity, the less it is stable [7].

In addition, it is useful to underline that the main resume of humankind knowledge says:

The increasing complexity of diversity (system object) is associated with an increase in consumption of feed resources from the environment.

The trainees must firmly grasp that the observed deviations from this rule are rare and extremely significant. Each educated person must understand also that:

The complexity of diversity in terms of enhancing their stability has some restrictions.

Therefore, one needs to roughly estimate the optimal complexity of diversity. Yet it is also necessary to know that the evolution and technical progress are in the direction of increasing numbers and increasing complexity of the manifolds and their components. This complication occurs in leaps and bounds in various fields of life and the speed is limited to domestic laws, some of which are not yet known.

Our environment is very complex. It consists of many various diversities with different nature and structure. All of them are in constant interaction with each other. There are two possible main ways of supporting these interactions. One of them is hierarchical. The second one has so-called *Net Structure*. In reality, it is more often that one can meet situations with combinations of both types of structures of interaction. The sudden change in the external environment is produced in this competition network system of interactions and usually has some advantages over the hierarchical one. Diversification here is created through the development of the variety of intersystem relations. Under normal conditions, the advantages have the hierarchical system.

The sharp complication of the structure of diversity, organized by hierarchical type, leads to the emergence of a large number of sublevels. The consumption of deep sublevels of system diversity resources is external to the sublevel, and at the same time is internal in relation to the diversity in General. This depletes the resources of diversity as relates to unity, and obviously, slows down internal resource and, in particular, information exchanges. It is highly likely that the rate of resource exchanges may generally serve as a basis for actual and theoretical allocation (education) of the new variety.

In Nature, various diversities are frequently in close contact with each other. The borders between two or more diversities form a transitional zone. Sometimes this zone is called with a biological term: *Ecotone.* In this area of knowledge ecotone describes a spread border between two diversities, which contain unique species and plants. They usually exist only in this zone. Frequently a seed is located in them, from which a new diversity is born. New important fields of application of the theory of diversities should be considered Humanities. Here, this theory explains the necessity of the simultaneous existence of different cultures. A number of historical patterns can also be understood, when studying the laws of evolution of diversities.

Approvals, which are briefly enumerated in this section, are the principal base for building modern instructional strategies at a tertiary level.

Conclusions

1. Theory of diversities is one of the basic fields in Universal Curriculum Core at a tertiary level.
2. The main stages of teaching the Theory of Diversities are described.
3. The learning of professional problems, tied to the theory of diversities, is the starting point after learning some general laws. It is connected to a detailed study of specific entities, which are gathered in a diversity.
4. All faculties should be familiar with the General principles of evolution of diversities. Only in this case it is possible to build optimal educational strategies.
5. Study of the possibilities of application of the theory of diversities in the Humanities knowledge is a promising direction in teaching several social science disciplines.

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