

Pedagogical Methodology as a Fragment of an Emerging Modern Scientific Knowledge

Metodología pedagógica como fragmento de un conocimiento científico moderno emergente

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ABSTRACT:

The article discusses the development of the national pedagogical methodology, which started in the second half of the twentieth century practically at the same time as the American philosopher Thomas Kuhn published his Theory of Scientific Revolutions, introducing the notion of "a paradigm", and Paul Feyerabend, Imre Lakatos and Karl Popper published their research papers, where they discussed the ideas of human cognition metodologization. The article also substantiates the points why the method, as declared by the national pedagogy, for re-encoding such methodology based on A. Novikov's approach is unproductive; it also explains why the widespread statement about the change of pedagogical research paradigm is not valid; identifies promising directions for the development of pedagogy methodology related to defining pedagogical theory structure and including mathematical modelling in pedagogy.

Keywords: social and human cognition, pedagogy, scientific methodology paradigm, pedagogical theory, mathematical modelling, experience of an individual as a subject of pedagogy, basic laws of pedagogy

RESUMEN:

El artículo discute el desarrollo de la metodología pedagógica nacional, que comenzó en la segunda mitad del siglo veinte prácticamente al mismo tiempo que el filósofo estadounidense Thomas Kuhn publicó su Teoría de las revoluciones científicas, introduciendo la noción de "un paradigma", y Paul Feyerabend, Imre Lakatos y Karl Popper publicaron sus trabajos de investigación, donde discutieron las ideas de la metodología de la cognición humana. El artículo también confirma los puntos por los cuales el método, según lo declarado por la pedagogía nacional, para recodificar dicha metodología basada en el enfoque de A. Novikov es improductivo; también explica por qué la declaración generalizada sobre el cambio del paradigma de la investigación pedagógica no es válida; identifica direcciones prometedoras para el desarrollo de metodologías pedagógicas relacionadas con la definición de la estructura de la teoría pedagógica e incluye modelos matemáticos en la pedagogía.

Palabras clave: cognición social y humana, pedagogía, paradigma de metodología científica, teoría pedagógica, modelos matemáticos, experiencia de un individuo como sujeto de pedagogía, leyes

1. Introduction

Though the science theorists widely profess the ideas of integrating natural sciences, mathematics and socio-humanitarian cognition, theorists, there is a fundamental difference between them. Tracing the outlines of a new paradigm of contemporary socio-humanitarian cognition that is just emerging, V. Kokhanovsky, in particular, notes that today this cognition is characterized by a dramatic expansion of the intrascientific reflection field, closer attention from the part of humanities to their own epistemological and methodological problems, and a desire to link the resolution of certain problems, that were traditionally tackled using the previously undertaken approach, with methodology (Kokhanovsky 1999). E. Prokhorov believes that "sociological research in specific areas clearly lacks adequate methodological support and calls on sociologists to view methodology of social research as the main subject of theoretical sociology" (Prokhorov 1994). Along with the social cognition methods that have been long in use, such as comprehension, dialogue, ideography, situational logic, etc., new methods are being added today, including introspection (the process of monitoring one's own state of mind in order to identify its governing patterns), projective methods that represent a non-direct way of defining a human personality through productive activities; empathy; method of debarred subjectivity, and a number of other research strategies.

A principalistic approach is being introduced today in the field of methodology of social sciences and the humanities: for example, V. Ilyin offers a number of principles of humanitarian knowledge, for example the principle of ethical tolerance seen as tolerance of an explorer to "alien" products of creativity, sensitivity to "alien" arguments; the principle of conditionality, which means that a researcher must understand the relativity of his/her own results, the possibility of different decisions being found by other researchers; the principle of political indifference, prohibiting the use of ideologemes, social utopias, myths, prejudices and a number of others (Ilyin 2011).

As the reflective status of humanitarian methods increases, they are being supplemented by hermeneutics, which leads the authors to see the explicative and interpretive forms of knowledge converge, along with understanding of their differences. Here is the citation from G. Wright: "...in ordinary word usage, there is no clear distinction between the words "understand" and "explain". However, there is a psychological connotation in the word "understanding", which does not exist in the word "explanation". It is being expanded by Edmund Husserl's phenomenology, which gives a specific meaning to the object defined by science and establishes the difference between the object and the meaning (Kokhanovsky 1999).

Completing the introduction to the problem, we set ourselves the task of identifying ways of interpreting the defined set of methods in the context of pedagogy, tracing how they have been already implemented within the historical perspective, finding out when was the national pedagogical methodology born and what general scientific "discoveries" were involved. We would also like to give a reference of the way pedagogical methodology as a holistic construct or its individual parts are understood and interpreted by Russian and foreign authors, for example, as regards the notions of a paradigm and paradigm shifts, and also to present the prospection for the pedagogical methodology's immediate development.

2. Research methods

The methods used include: analysis of the methodological and scientific literature; mapping trends to methodologize humanitarian cognition in foreign and in national education in the second half of the twentieth century; identification of reasons behind the 'birth' of the national pedagogical methodology; identification of gaps and blank spots in the pedagogical methodology, and ways to close and eliminate them; analysis of the degree of development of the pedagogical theory's structure, a methodological project of pedagogical theory implemented following the logic similar to the physical theory; analysis of productivity in the use of contemporary pedagogical cliché "paradigm shift"; evaluation of results and scientific

prospections by contemporary education methodologists; identification and analysis of grotesque forms of a pedagogical paradigm shift in the logic of "semiological shift".

3. Literature review

It is especially important for us that today the methodologists of science are unanimous in stating that the new, just emerging paradigm of social cognition is characterized by the increasing desire of humanities scholars to increase the theoretical and conceptual status of their respective sciences, find new methodological approaches, complement the toolkit with attributes of mature theoretical knowledge: concepts, categories, principles, abstractions, idealities, various philosophical positions. This trend is clearly traceable in all humanitarian areas.

Despite the diversity of views on the rationality in the humanities, scientists recognize the rational consciousness as the necessary cultural value, and this rationality focuses today on the desire to identify humanitarian methodological approaches and imbed them in the scientific consciousness without copying the methodology of mathematical and natural sciences. The complexity here, in our opinion, lies in the fact that the line demarcating rational and irrational is rather indistinct and fluid in the humanitarian spheres, because the humanitarian sphere, for example, features, along with rational forms, essentially irrational ones, in particular such as religious consciousness. Nevertheless, there is clearly a rationalistic focus in the humanities as they attempt to find the forms of describing and obtaining the result.

It is especially important for us in our review that the maturing humanitarian methodology is being guided not only by cognition as a process but by the social practice as well, trying to theorize and methodologize the latter; scientification of the social sphere and social practice is gaining relevance. The idea found vent in such area as praxeology (Polish philosopher Tadeusz Kotarbinski) – it is a general theory of any rational activity, that elaborates and explains common rules and regulations for any activity based on the historical experience accumulated by people (Kotarbinski 1975). Jumping ahead, let us note that the methodology of educational research activity, which includes pedagogical experiment explicitly going to practice, fits, in a cohesive way, the praxeological basis.

The point made by the German sociologist Joseph Weiss, who noted that the technical and practical possibilities of the social science grew along with its formalization and generalization, and hence along with its remoteness from life experience, will be the next step in reinforcing the status of methodology of pedagogical science. Let us also note J. Weiss' opinion that the social science study results cannot be used without them being first reviewed by those who will be actually using them. The scholar attributed methodological regulations and rules to the domain of such review (Weiss 1992).

We believe it is necessary to substantiate the thoughts we have just mentioned with the research by the American philosopher Thomas Kuhn, who put forward the idea of a paradigm as a standard of activity accepted by academic community. The paradigm, in Kuhn's view, is the base unit of measure for scientific development, a conceptual framework that has been, for a certain period of time, accepted by academic community as the standard of their scientific activity, a set of beliefs, values and tools accepted by academic community, this is what unites this community: the academic community consists of people who accept a certain paradigm (Kuhn 2009).

The Kuhn's paradigm includes: a metaphysical part (in-depth philosophical underpinnings), as well as generally accepted patterns, accepted examples of solving specific tasks and value systems that influence the choice of the line of research. Particularly important, in our opinion, is Kuhn's idea that scientific knowledge takes shape and develops within the framework of premises, within a sort of protoform that generates these premises. Thomas Kuhn takes a balanced approach in assessing the scope of "methodological guidelines" just defined by including them in scientific development and combining them with 'random' elements, that are inevitably present in this process and are related to individual mindset of a researcher, his previous academic experience and insight. Nevertheless, the scholar emphasizes that methodological rules and instructions govern scientific activity and prevent

science from "losing its way". In respect of the early stages of the development of science (it is especially relevant for pedagogy), T. Kuhn points to the following fact: "There is no way you can interpret natural history if theoretical and methodological premises, principles that allow for selecting, assessing and criticizing the facts, do not intertwine, even if only implicitly" (Kuhn 1963).

T. Kuhn believes that generalizations of scientific laws, scientific terms and theory are the most "binding". Such instructions provide the scholar with the rules of the scientific "game" and set the line for a particular situation within a research field. T. Kuhn notes the importance of more generalized philosophical instructions: a scientist should strive to understand the world, expand the scope of knowledge and enhance the accuracy of its regulation based on the outlook and ways to describe it as are offered by philosophy.

Slightly different views can be found in the works by Paul Feyerabend: talking about Kuhn's methodological instructions, he says that they are designed to give a scholar certain normative rules, however the real practice of scientific research matches highly approximately. Nevertheless, the philosopher does not lean toward methodological nihilism and generally supports a normative interpretation of Kuhn (Feyerabend 1975, 1986).

Finally, let us use the ideas of Imre Lakatos for our justification: "method" and "methodology" are key terms in his concept; the author stresses the similarities at the level of correspondence between the subject-oriented scientific research programs and methodological programs, and notes that failures in scientific work result, in particular, from the lack of attention to methodological problems or their total disregard. Just like T. Kuhn, I. Lakatos notes the socio-cultural background of scientific methodology, believing it should be supplemented by many components that do not fit, according to natural scientists, for example, the traditional understanding of science. However, he backs the idea of specific knowledge methodologization (Lakatos 1970).

The sources listed above can be supplemented by the works of Karl Popper, who stated that science is not "a rich collection of statements" (Popper 1995) but rather a system of notions, concepts and theoretical problems. According to Popper, to avoid such errors, a system of various methods is needed. The following quotation is especially relevant in this context: "Science is characterized not only by its logical form, but also by its specific method." The author warns against two extremes: giving absolute priority to the method and ignoring it, and by establishing the method's relative role, the author does not slip into methodological nihilism.

The entire content mentioned above is directly related to the pedagogical methodology as part of social and human knowledge, which until mid-last century was developing without any attempt to clearly understand its own methodology by fully attributing to itself all the conclusions made by methodologists in the area of human cognition and customizing them with due regard to its own specific features.

Modern foreign sources also feature a research by Georgi Gardiner which states that the post-non-classic image of social cognition as shaped by contemporary philosophers and science theorists, includes, in particular, the fact that the "soft" methods of social cognition do not discard knowledge that is ordinary, instinctive, etc., placing it in the epistemological hierarchy. Today, philosophers and science theorists "allow" a social scientist to shift the focus of research from objectified forms of human activity to subjective values. Traditional social sciences do not seek to give simple explanations of phenomena or processes or provide clear-cut options for predicting them, being guided by possible scenarios of their development that are attributed to probabilistic approach. In light of this, the problem of designing a social cognition methodology, determining the mere possibility of its creation comes to the fore (Gardiner 2015).

The author also points out that in the process of analysing the literature that reflects methodological problems of social cognition, a lot of controversial is being revealed: researchers argue if it is possible to compare mathematical and social humanitarian cognition, how to position the category of "rationality" in social cognition, how to verify the social cognition result, what are the criteria of verifying the result of such cognition, and, finally, if it is expedient to draw a demarcation line between methodologies of concrete areas

of the humanities knowledge, whether they have the right to exist.

The epistemological aspect of the philosophy of education is being discussed in his work by Duncan Pritchard, who describes modern post-non-classic stage of social and humanitarian science, filled with philosophical generalizations of educational problems, and splits the cliché "philosophy for education" and "philosophy in education science" (Pritchard 2013). Problems of methodological individualism are being discussed in Joseph Heath's work, which represents the correlation between the methodologically explicit and tacit knowledge (concept by Michael Polanyi), research methods and strategies used as a "framework" by academic community and each individual researcher, who has formed, in the course of individual or joint research activity, an individual methodological style of scientific work, and the unique features of such style are manifested in the choice of research methods, methods of interpreting the results and their reflection (Heath 2015).

The problems of critical thinking in research are discussed by Christopher L. Coney who typifies the procedures for critical reevaluation of educational reality and methods of its research, as well as research results. The author reveals how critical intentions of a researcher of education correlate to his/her creative potential and the ability to generate new conceptual models and technological solutions (Coney 2014). The content-related problems of educology as they pertain to the encoding of pedagogy as a science studying the sources of social and personal experience of the subject of education, the problems of its transformation during the process of learning and education are being discussed by David Lundie in his article (Lundie 2015). The ideas he puts forward are similar to those offered for review by the Russian methodologist of pedagogy Alexander Novikov.

The ideas and solutions presented testify to recognition by the authors of pedagogical knowledge methodologization, however no specific solutions that could be used as an alternative in developing the national education methodology are offered. This allows us to conclude that the subject specified in the title of the article is relevant.

The purpose of this review is to present to the reader, with the maximum degree of completeness and detail, the scientific and philosophical 'backing' for the idea of social and human cognition methodologization, to show that a relatively "new-born" pedagogical methodology has epistemological roots. Now let's elaborate these ideas.

4. Findings of the study

Pedagogy as a field of knowledge has formed quite a long time ago and has been developing outside any methodology as a theory based on generalization of specific experience at schools, universities, military academies, in family and religious education, other segments of society related in one way or another to education, on the one hand, and as a refinement of philosophical ideas in the education domain, their segmented interpretation, on the other. A great many books, articles, textbooks and manuals have been written describing training and education experience that has been philosophically reflected on, and in some cases, it turned into a cultural phenomenon, however, it was not interpreted as a scientific method and not measured from the point of view of scientific rationality. The situation has changed in the middle of the last century, when scientists addressed this problem and defined a segment of science studies, that claims to have the status of a subject area, named pedagogical methodology. This name was given to the knowledge about the methods of scientific research in pedagogy, about presentation of the results obtained and about the work a researcher carried out to obtain this result (we make no reference here to non-traditional definition of methodology given by A. Novikov (Novikov 2005) as we will analyse it later).

We would take the liberty here to formulate the main reasons for the emergence in science of such field of knowledge and list among the points the societal order for education to clearly define the means of achieving positively valuable results in training and education of the generation of actors that make up the society, on the one hand, and excessive generality of philosophical ideas underlying pedagogy, on the other. In addition, it should be noted that by this time, a solid layer of pedagogical experimental knowledge has been accumulated, however it was not adequately interpreted from the point of view of its extensive practical

use. The third reason, in our opinion, is the extensive layer of psychological knowledge that has been accumulated by that time, which was both philosophically determined and purely practical, however, it was not popular with pedagogy for a number of reasons. The fourth reason behind attempts to methodologize pedagogy and doing research in this field we see in a certain "limit of accumulation" meaning the accumulation of knowledge in general scientific methodology, both in foreign and Russian, particularly in the works by the authors represented in our review. Their publication coincided with attempts undertaken by national pedagogy to develop its own methodological thesaurus, and there are reasons to believe that national methodologists sought out samples of foreign methodological approaches.

Such accumulation sparked the science theorists' natural interest to pedagogy, which has not been yet methodologically formalized. Against this background, a lot of questions popped up addressed to educators and empirics regarding possible synthesis of pedagogy and psychology, pedagogy and philosophy, since it was clearly understood that such synthesis was necessary but not implemented: is it possible to draw a demarcation line between pedagogical knowledge and philosophy and psychology, or they should be analysed as immanently pieced together; what method should be used in each of the cases to develop pedagogy itself; how it should be positioned – as an applied scientific theory or as scientifically non-autonomous domain of specifying philosophical and psychological concepts, which does not claim to have the status of applied theoretical knowledge; what theoretical construction method (in respect of the first case) should be used – an axiomatic or principalistic method that is similar to natural science and mathematics, or a specific method which is demonstrated in any near-pedagogy domain of the humanities knowledge represented theoretically. Response to this challenge took the shape of works by Mikhail Danilov, Vladimir Gmurman, Volodar Krajewski, Valentin Polonsky, Vladimir Zagvyazinsky (Krajewski 2006), and works written later by Alexander Novikov (Novikov 2010) and other authors. In particular, they attempted to determine the subject of pedagogical methodology, and the first five authors practically found the common denominator, by adding to the definition a body of pedagogical cognition methods, pedagogical knowledge about cognition structure, methods of encoding the result of research and efforts undertaken by a researcher to obtain such result. This is where we can agree, however our objections concern A. Novikov's approach, who added three components to methodology, namely methodology of research, methodology of practical pedagogical activity and methodology of learning activity (Novikov 2010). As a result of adding the last two, the author's methodological content came to include the components that were earlier traditionally attributed to pedagogy and methodology as its part, and this overlap turned out to be rather extensive. The aim of such expansion is absolutely unclear, its footprint (methodology as a theory about activity) can be traced in the works by Polish science theorist Tadeusz Kotarbinski, who offered a broad definition of "methodology as a theory about activity", stressing the need for general methodology to go beyond scientific cognition, for its subject matter to include any type of human activity (Kotarbinski 1975). However, this argument does not justify the inclusion into the methodological domain of science of its own content.

Having subsequently accumulated a very solid layer of knowledge, this area of science has also accumulated just as many serious questions to itself. They include, among others, the question of whether the pedagogical theory is possible at all. Can it actually exist being separated at least theoretically (or hypothetically) from philosophical or psychological theory, or any such attempts are a priori doomed to failure? What is the apparent interdisciplinarity of pedagogy, both at the level of knowledge itself and at the level of method used to acquire it – is it good or it is pain? The same goes for the set of issues pertaining to the possibility of presenting pedagogical knowledge, following the logic of scientific law, as a stable relation between the phenomena, and the possibility to limit oneself to principalistic presentation. The latter was implemented, in one way or another, and even included in pedagogical encyclopaedias, for example, the well-known training principles that include the requirements of scientific character, clarity, accessibility, consistency, practical orientation of training and a number of others. However, the ambiguity of the ground used to identify such principles, the ambiguity of the mere possibility of placing these principles within the same logical range is also quite clearly fixed.

Methodologists of education undertook many attempts to develop a scheme of educational theory. For example, V. Krajewski attempted to do it by demarcating pedagogical domain, and the provisions of a purely pedagogical theory included the following: the means of teaching are determined by the tasks and the content of a particular pedagogical situation; the effectiveness of the teaching process naturally depends on the material, hygienic, moral, psychological and other conditions in which it occurs; the level and quality of learning depend on how a teacher factors in the level of personal relevance for the student of the material to be digested (Krajewski 2006). These and other similar phrases are rather shallow and often trivial, and they could have hardly claimed to become the contemporary theory provisions.

We believe that we should not limit ourselves to criticizing the low degree of development of pedagogical theory by our predecessors, but rather offer our original perspective for discussion. Despite the opinion of science theorists, that is currently gaining momentum, who think that the humanities knowledge does not comply with canons from the point of view of developing theoretical schemes, we will nevertheless try to draw a mild analogy between the widely known structure of physical theory and pedagogical one. As far as the physical theory is concerned, the natural science methodologists identify: empirical grounds, the core (the body of basic laws, physical values and equations), consequences and experimental validation or refutation of the theory. In pedagogical theory you can find some corresponding projections. For example, for a well-known theory of problem-based learning such empirical ground is in the certain degree of similarity between scientific and educational cognition (though we are not talking about their identity), in phenomenological data on how to increase motivation to study in schoolchildren and students when they come across scientific problems, problems that have not been solved, problems that require further reflection, etc. As the core of the theory, we could suggest the pillar idea, backed by, among others, John Dewey's psychological school, which states that learning solves many current tasks, if it includes teacher-assisted activity of pupils (students), which is being guided by scientific inquiry logic and is represented as the following chain: problem situation ® educational problem ® joint effort by the teacher and the students to solve it ® analysis of the results (reflection and modification). Theoretical consequences (as they are called in physics) can be put in the analogy relationship with the teaching methods, mediated by this idea, that are used in secondary and higher education, and while interpreting them, it is possible to identify the typology of case studies suitable for presentation in a problem format, and situations where this format is not necessary for whatever reason (setting the theory applicability boundaries). Educational practice data on the results achieved by the students, their subsequent analysis and the resulting modification actions that can serve as the theory's experimental support.

This is just a discussion format so far, but the problem of the pedagogical theory's structure is quite relevant today and needs a solution.

We will focus our further consideration on scientific paradigm. This is the area of the pedagogical methodology that is presented in a very polyphonic way. The original concept of a paradigm is given in T. Kuhn's paper "The Structure of Scientific Revolutions": a paradigm represents all universally acknowledged scientific achievements that give academic community, over a certain period of time, a model for setting problems and their solution (Kuhn 1963). The 1969 annexes specify two things: 1) a paradigm is a specific example of scientific discovery, "a specific set of requirements for scientific teams" (meaning the community of natural scientists and humanists); 2) a general mechanism of scientific development is the unity of "normal science" and "non-cumulative leaps" – scientific revolutions.

On the "normal science" interval, T. Kuhn identifies "methodological guidelines" that prevent science from "losing its way". However, it's not enough just to know the guidelines, since they are supplemented by specific content of a particular scientific knowledge domain. At the same time, T. Kuhn notes that a creative thinker not only "complies" with the methods but also engages in their transformation or change, when it becomes obvious that the results of their use became non-productive. This brings about the need for a paradigm shift, a stage when it becomes necessary to change methodological instructions, what T. Kuhn calls

"reconstruction of instructions" which modifies all instructions and introduces new ones. For those readers who are familiar with physics, let us note that such paradigm shift occurred at the turn of the twentieth century, when the "old" paradigm, Galileo's principle of relativity (methodological direction of activity), proved its inconsistency: Maxwell's Equations of Electrodynamics turned out to be noncovariant in reference to Galileo's transformations. Furthermore, a paradigm shift did not mean waiver of the principle of relativity itself – it was about its modification, change of equations when Galileo's equations gave way to Lorenz equations, however the principle of relativity remained, only the specific "mechanism" of its implementation has changed: now the requirement to the new theory to be in line with this principle was governed by different mathematical equations.

The widely accepted definition of a paradigm today is the one that defines a paradigm as a model of scientific activity that includes a set of theoretical principles and standards of research, methodological norms and value criteria, and this is essentially similar to Kuhn's classic concept. A number of definitions become more specific and declare paradigm as widely acknowledged scientific achievements that provide academic community, over a certain period of time, with a model for setting a resolving a problem.

So what does actually change in the paradigm of pedagogical science and how does this change, if any, fit into the evolution of scientific knowledge? A general answer can be found in the specific features of post-non-classical stage of scientific cognition, which have already been included in the manuals; as for the specific answer for pedagogical knowledge, we will try to articulate it now. One of the points here will be modelling that is being widely implemented in pedagogy, for example, mathematical modelling that reflects the post-non-classical thesis about the convergence of mathematical and humanitarian knowledge.

Among the first pedagogical works which made an active use of models, was a thesis by Mikhail Vyaldin on information modelling of training content, and the model created allowed dividing the content offered to the students into sections and lesson topics equally so as to avoid any information overload or information inadequacy that inevitably arise if the planning is (Vyaldin 1986).

Today the process of integrating mathematical models into pedagogy is gaining momentum, for example, some authors use theory of graphs for pedagogical patterning (Isayev 2003), and a framework of the actively developing interdisciplinary field – a theory of complex system self-organization (synergetics), even though such framework is explicate and difficult to implement. We believe that a recently published book by Yevgeniya Solodova, "New Models of Educational Process", (Solodova 2011) can be classified as the work that presents this aspect in the most straightforward way (Solodova 2011).

Thus, the review given allows us to present a number of its provisions as a research finding. The first provision is: the emergence of methodological reflection in Russian pedagogy in the mid-twentieth century occurred simultaneously with the emergence in Western philosophy of the theory of scientific revolutions (Thomas Kuhn), along with the development in Western science of views on methodology of social and human research (Joseph Weiss, Karl Popper, Imre Lakatos, Paul Feyerabend), which, despite certain polyphony, still agree that the regulations and frameworks in social cognition do exist, both at the level of methodological instructions and at the level of prohibitions. This has manifested in greater coherence of the general approaches to methodologization educed from the works of Western and Russian researches that date back to the emergence of pedagogical methodology. This was partly due to reaching a "critical limit" of scientific knowledge (both in Russia and in the West), on the one hand, and on the other, due to the lack of methodological approaches in pedagogy, and in the middle of the last century, educationalists were becoming more and more aware of it.

Secondly, attempts to give flesh and blood to the Russian pedagogical methodology undertaken in the next 60 years did not produce any meaningful result, leaving a lot of questions both about the structure of pedagogical knowledge itself and ways of its "construction" and methods of obtaining such knowledge. Attempts made by Volodar Krajewski to identify a pedagogical theory that has been demarcated from the rest of the sciences were unsuccessful, and the idea of pedagogy's demarcation from psychology and

philosophy was not productively developed in the works of educators, remaining only at the level of declarative statements, which gives us reason to believe that such idea is generally unproductive.

Methodological shapelessness of modern pedagogy led to very sad results: in the past 30 years, pedagogical knowledge gained incredibly multiplicity and variability, and a mass of practically identical phenomena have been termed differently while the ones that were rather different have been termed in the same way.

Thirdly, the idea of a paradigm shift in the national pedagogy was not enough theoretically developed (sometimes being encoded as the idea of the multi-paradigm). At present, you can only talk about its emerging contour, the impending paradigm shift, not about its fundamental shift. For the latter, the scientific basis in national pedagogy, it has not yet been established. The mentioned shift can be confirmed by the introduction of patterning techniques into pedagogy, requiring efficient matching with mathematics and qualitative insights.

Fourth, in the past decade a new impetus to pedagogical methodology was given by Alexander Novikov, and the attempts to structure the new content field of the "private" science were definitely positive. However, they did not produce any new vision of pedagogical methodology, only adding to it many things that have been traditionally attributed to private techniques and didactics; we see no sense in this transfer.

Fifth, pedagogical methodology has come to the point where it is necessary to understand what a pedagogical theory is. One of its possible structures is the 4-component scheme given in the text, a physical theory analogue: empirical grounds, the core, consequences and experimental validation. For example, the theory of problem-based learning as it is presented in this article earlier.

5. Results and discussion

How has the pedagogical methodology been developing in recent years? Along with pervasive claims by the authors to a paradigm shift, attempts to re-encode the pedagogical knowledge content and clearly formalize its structure can be attributed to methodological transformations. Today you find the "paradigm shift" cliché in every magazine or book on education and pedagogy, and the versions include not just relatively inaccurate ones like the one we have just discussed but even funny. In 2017, an article by A. Polonnikov, "The Semiotic Turn in Education", was published in the "Higher Education in Russia" magazine, which specified the shift to a new pedagogical paradigm signified by the research focus shift from the subjects of designation to the method of their designation, thus bringing the problem to the pedagogical text directly (Polonnikov 2017).

The next fragment of discussing the results presented in the previous section will be yet another reference to Thomas Kuhn's theory of scientific revolutions. As it was already noted, this theory presents the history of science as the change of periods of "normal development" and cumulative leaps, following one another. Thomas Kuhn's theory was challenged, it had to be supplemented and explained and was subsequently seriously transformed, and the main point of its opponents was in the different character of post-non-classical science development, unlike the one described by the author (Kuhn 1963). One of the evidence here is the development of national pedagogy: our analysis shows that the current stage is neither a "normal development" nor a cumulative leap. The ongoing accumulation of knowledge, the multiplication of its description versions, the erosion of terms reveals the non-compliance by the researching authors of the original "instructions" that exist today in humanitarian methodology, and the evidently undesignated nature of the change in direction of these "instructions".

6. Summary

Having emerged in the mid-twentieth century, the national pedagogical methodology outlined its own subject practically at the same time as Thomas Kuhn articulated his "methodological instructions" and Imre Lakatos, Paul Feyerabend and Karl Popper put

forward their ideas about the methods of human cognition. It was in line with the ideas of human cognition methodologization, which were being actively proclaimed at that very time, however, despite the rather extensive period of time (60 years), it failed to be formalized in terms of its structure and content. The ideas of a paradigm shift that are being declared today by many researchers, are in the majority of cases methodologically unproductive. More relevant is the point about the upcoming paradigm shift. This shift is being regarded as a promising direction in the search for possible categorial designation of pedagogical theory or bits of theoretical knowledge; and one of the most promising directions here is the attempt to include models of pedagogical phenomena or events into the structure of this theory. We suggest orienting the pedagogical theory development, as the basis of discussion, on the physical theory's structure that includes: empirical grounds of the theory, the core, theoretical consequences and experimental verification. It is rather difficult at the moment to include models in the pedagogical theory's structure, and this is manifested, for example, in many original analogies of technical device and human memory – they turn out to be groundless and unproductive. This determines the search for model description methods that would be appropriate for specific features of modelling objects, the search for the forms of splitting models of quantitative and respective qualitative conclusions. The search for such models is hampered by the complexity of the man-sized modelling object and because it is difficult to present it in mathematical terms. For today, the field for research is quite extensive, but there are very few authors, who deal with pedagogical methodology on a regular basis and who publish their works in leading magazines. The research potential available is clearly insufficient, and this determined the necessity to turn to science theorists who position themselves as philosophy scholars.

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