Western European Journal of Modern Experiments and Scientific Methods
Volume 2, Issue 2, February 2024
https://westerneuropeanstudies.com/index.php/1
ISSN (E): 2942-1896 Open Access| Peer Reviewed

THEORETICAL FOUNDATIONS FOR THE DEVELOPMENT OF EDUCATIONAL MODELS IN TEACHER TRAINING TECHNOLOGIES

Anarkulova Gulnaz Mirzaxmatovna –
Professor of TSPU named after Nizami

Annotation: The article reveals the essence of the theoretical foundations of educational models. The functions of educational modeling and the results of research on the development of educational models are also considered.

Key words: modeling, educational models, functions of educational models, types of educational models.

The modeling method is quite multifunctional. However, it would be wrong to consider this multifunctionality (as it occurs in modern research practice) as the original characteristic of modeling. Based on the analysis of sources, we can state that the functionality of the model method has undergone a complex evolution. During this evolution, models acquired the ability to perform new functions; at the same time, the previous functions became more complex and deepened, the mechanism for their implementation was improved, and the effectiveness of the results of the model study increased.

In our study, we did not set ourselves the goal of tracing all the specific lines and stages of the evolution of the functions of educational models, but the purpose of this message is to identify the characteristics of the main general trends in the development of the functions of educational models.

Based on a content analysis of the scientific literature on modeling, we identified two most important trends that included the essential characteristics of smaller definitions. This is a tendency towards theoreticism and a tendency towards heuristics.

Let us first consider the trend toward theorizing of educational models.

The research work carried out in the training of teachers of Technology, the study of the theoretical foundations of the method of scientific modeling and its practical application in educational systems gives grounds to assert that in this process the dialectical path of the formation of pedagogical theory is expressed - through many models (the first stage of searching and analyzing analogues according to similarity criteria), characterizing individual aspects of the educational process, to a synthetic theory that consistently reveals, in accordance with experiment (the second stage of creation and operational research of the model), the essence of the process as a whole (the third stage of synthesis and transfer of knowledge).

It is obvious that the imitation function of modeling is inextricably linked with the activity of cognition. When the conditions for constructing a consistent theory are not yet ripe, a model of a phenomenon or system, including certain aspects of their simplification, serves as the first point of knowledge in a new sphere of pedagogical reality, marking the starting point of the penetration of scientific and pedagogical knowledge into this new sphere.

Western European Journal of Modern Experiments and Scientific Methods
Volume 2, Issue 2, February 2024
https://westerneuropeanstudies.com/index.php/1
ISSN (E): 2942-1896 Open Access| Peer Reviewed

In the future, in the modeling process, this point will be expanded, but this does not diminish the role of the model as the first step of research. Counting on the appearance of a complete theory immediately means, in most cases, dooming pedagogical knowledge to passivity and illusoryness. For scientific and pedagogical research using the modeling method, cognition proceeds from the first models, which significantly simplify the picture of the process, to models that are increasingly adequate to the process and, finally, to a consistent theory of this process.

During the epistemological analysis of the functions of educational modeling, we identified a number of functions that, of course, are not alternative, but can coexist in educational models. At the same time, not all of these functions must be inherent in each of the models under consideration. On the contrary, such functions, as it seems to us, are characteristic not only of models, but also of other cognitive forms. However, in general, all these functions in their dialectical unity represent a generalized epistemological systematization of the role of the modeling method in scientific and pedagogical knowledge. Of course, as it turned out, this role cannot be absolutized; it is revealed when taking into account the unity of the model method with other cognitive forms and methods. Moreover, consideration of their relationship with scientific and pedagogical theory is of decisive importance in analyzing the cognitive role of the model.

We believe that in the process of modeling educational systems, the current, constructed model represents, as it were, a preliminary form of explanation, in which the “embryo” of a new theory is hidden - the highest product of pedagogical knowledge. This is how the question can be posed when considering the cognitive forms of the model in the trend of their development. Of course, it is important to take into account that the model is not an end in itself, but a means of developing a new theory.

From here it becomes quite clear that the main cognitive task is to build a consistent theory tested by practice, and the model serves as a means in relation to which the scientific theory acts as a goal. Having emerged, a new pedagogical theory does not discard the used models (educational systems), but subordinates them to itself, filling them with new content. After constructing a new pedagogical theory, the old dynamic models become a methodological means of understanding and assimilating it, and logical conclusions turn into the criterial apparatus of the theory.

When preparing Technology teachers we base ourselves on this model. The education process is based on the theory of knowledge and in practice the application of acquired knowledge.

Starting a theoretical study of a new sphere of pedagogical reality, for which, due to a lack of data, a consistent theoretical concept cannot be immediately built, pedagogical science begins to model this phenomenon in parts. At the moment, during the research, a difficult question arises: which of the scattered experimental data should be used as the basis for the emerging innovation model. This is the problem of selecting initial theoretical information, the problem of how that cell is born, from which a new scientific theory will then grow in the future. It seems to us that the methodological principles on which researchers will rely can play a decisive role in this process. In pedagogical cognition, there is a movement from some initial methodological idea to some ontological hypothesis, embodied in a model that characterizes the essential aspects of the original object itself, which is directly related to the original methodological idea.

Western European Journal of Modern Experiments and Scientific Methods
Volume 2, Issue 2, February 2024
https://westerneuropeanstudies.com/index.php/1
ISSN (E): 2942-1896 Open Access| Peer Reviewed

In the history of pedagogy there are a huge number of wonderful examples confirming the legitimacy of such conclusions. A correctly identified essential characteristic of the ideas of reformist pedagogy made it possible to create a number of unique educational systems in Europe and America (Labor schools in Germany, Summerhill schools in England, French lyceums, Just Communities and Kohlberg laboratory schools in America, etc.).

From all of the above, it follows that the important principle for understanding the theoretical mechanism for constructing innovative educational models is the importance of the original conceptual modeled feature of the phenomenon or system that underlies the construction of a new model. This principle is an epistemological condition for the theoretical foundations of modeling educational systems, expressed in the general methodological requirement of specificity, which should be sought on the basis of the criterion of practice and taking into account the connection of models with all other forms of cognition, and primarily with theory, the search for which is subordinated to the entire act of modeling innovative educational systems.

If the tendency towards theoreticism characterizes the functional evolution of modeling, primarily in terms of the emergence of ever new, more theoretical functions, that is, in terms of the macrostructure of this evolution, then the tendency towards heuristicism characterizes it, primarily in terms of development within each function, that is, in terms of microstructures of evolution.

Before we begin to analyze the heuristic trend in the development of educational modeling, we will define this concept. All definitions of the concept of “heuristics” are associated with the discovery, foresight, prediction, and guessing of the future. In general, the statement of this connection is beyond doubt. Indeed, the fundamental feature of any discovery is that it always relates to the future.

In the course of experimental work, we were able to establish four heuristic characteristics of educational models:

• predictions based on the simple repeatability of pedagogical phenomena;
• predictions by analogy and model predictions;
• predictions based on the system’s own conceptual law;
• predictions based on the newly created pedagogical theory.

Fixing the simple repeatability of pedagogical phenomena in research practice can be called an empirical dependence or an empirical law. It is obvious that the empirical law itself is a weak form of fixing the natural connections established in educational processes. Accordingly, predictions based on the simple repeatability of pedagogical phenomena turn out to be very unreliable, since there are many side factors (environment, heredity, upbringing) that can have an unforeseen reaction to the result at any time.

But, despite the unreliability and imperfection, predictions based on the simple repeatability of pedagogical phenomena are widespread in the practice of cognition, and, above all, in the everyday consciousness of researchers.

At the first stages of a model experiment, when they are just starting to study and select educational systems, when the laws and patterns are unknown, when there is no corresponding theory yet, this form of heuristic search must, of course, be resorted to. Therefore, one cannot associate the scientific approach to the study of an educational object only with that high degree of development of knowledge when there is a coherent, developed theory.

Western European Journal of Modern Experiments and Scientific Methods
Volume 2, Issue 2, February 2024
https://westerneuropeanstudies.com/index.php/1
ISSN (E): 2942-1896 Open Access| Peer Reviewed

Firstly, the theory itself does not arise immediately, and the establishment of empirical laws is often its necessary prerequisite. Secondly, one should not sharply contrast or separate science and ordinary pedagogical consciousness, for they closely interact and are interconnected, at least from the point of view of a critical understanding of the experiment.

Foresight, by analogy, represents a higher stage of development, predicting the ability of the general trend in the development of educational modeling. But, despite this, it also cannot be called a completely perfect and accurate type of foresight.

The fact is that those signs of phenomena, the identification of which in this case forms the basis of foresight, may, with further passage of the stages of studying the capabilities of the model, turn out to be insignificant and accidental. In such situations, the pedagogical "discovery" turns out to be false.

In the course of the development of systemic educational modeling, foresight by analogy is constantly being improved and its accuracy is increasing.

When building an educational model, we are exploring an object whose laws have been more or less studied. In other words, an object whose behavior can be predicted on the basis of knowledge of its own laws is selected as a model (or its component), which is destined to carry out the function of prediction. A characteristic feature of model foresight is that it is based not on the law of the predicted object, but on the law of another similar object.

Foresight based on its own law of development is characterized by the specific characteristics of this law.

One of these characteristics is the degree of generality. The greater the degree of generality of the law used in the basis of foresight, the greater the degree of generality of the resulting forecast, that is, this forecast turns out to be concretized and detailed to the extent that the scientific law is concretized and detailed. Actually, this heuristic characteristic of modeling functions is of a transitional nature in relation to theory-based prediction.

If we translate the above provisions into the language of a model experiment, it turns out that this level of heuristic modeling tendencies is quite high and arises already at the third stage of the modeling process, when the innovative model begins to synthesize and transfer theoretical knowledge both to individual elements of the original and its analogues, and form a new theoretical pattern. However, this moment has certain specifics.

A new pedagogical theory obtained as a result of a model experiment is not just a sum, a set of laws, but a certain organized, logically coherent system of scientific and pedagogical laws. As it turned out as a result of the study, the laws in the innovation system are connected into a single complex, a kind of organic integrity. Therefore, the new pedagogical theory is broader than a separate scientific law, richer in content. This theory is not limited to the reproduction of knowledge expressed in a scientific law, but provides an explanation of the objective significant connections reflected in the law of pedagogical science, and at the same time interprets all other facts and processes that interact with these connections. It is precisely because of this that theory is able to create a basis for predictions that are more accurate and detailed than predictions based on individual laws of pedagogical science.

One of the significant features of the method of scientific modeling of educational systems is the fact that the multi-stage modeling process itself is made up of a certain set of laws, which by the third stage of the research work are formed into a certain theory, which gives direction to further research and leads to the anticipation and discovery of new laws and facts . This is one of the main features of the theory obtained as a result of modeling.

Western European Journal of Modern Experiments and Scientific Methods
Volume 2, Issue 2, February 2024
https://westerneuropeanstudies.com/index.php/1
ISSN (E): 2942-1896 Open Access| Peer Reviewed

One of the most important questions that can be resolved with such an analysis in educational systems is the question of how complete this theory is, and for this it is necessary to deeply study its structure and supplement it with missing links. Such additions and clarifications are essentially predictions.

Of course, this is not the only way to predict based on theory. However, it is extremely important, since in this case the theory itself is enriched. The fact is that such theoretical predictions are often realized that add practically nothing to the existing theory. For example, all kinds of modification system formations of developmental education undoubtedly enriched pedagogical practice, but did not change or add anything to the fundamental provisions of the theory of developmental education created by V.V. Davydov, they only clarified, added, and fragmentarily verified something.

To more accurately define these two types of predictions, we will use the terms “analytical prediction” and “synthetic prediction.” As for analytical predictions, they do not expand the underlying theory.

Thus, analytical foresight in educational modeling is only the application of a ready-made theory to a certain special case. This is approbation work, for example, on the introduction of various educational technologies into the educational process, while synthetic work, on the contrary, completes an incomplete theory and supplements it with missing links. An example here is the direct process of modeling, as a result of which the pedagogical theory is significantly enriched, and along with it, all the structural components of its subsystem are filled with new methodological ideas.

Strictly speaking, analytical foresight is nothing more than applied foresight, carried out in the process of using theory in practical or cognitive activity. This is the transfer of the original model to another environment for the purpose of its applied use, namely for the purpose of building its analogue for a deeper study of its explanatory theory in order to find a new theory for making an innovative breakthrough in educational technologies.

The analysis carried out is important for characterizing the development of pedagogical theory in general and its predictive role. Scientific pedagogical theory in the process of its development tends to turn into an increasingly complete and complete (relatively closed system of laws). Therefore, the more developed and complete a theory is, the smaller the share in the number of predictions made on its basis is occupied by synthetic predictions and, on the contrary, the larger role belongs to analytical predictions.

Analytical predictions in philosophical science, in particular by K. Popper, are called technological, instrumental, applied on the basis of a ready-made theory. Developing this idea further in the book, K. Popper identifies three main functions of science: testing laws, prediction and explanation. If we project this position onto the modeling process and group and integrate all the functional characteristics of this method, it turns out that all types and forms of educational models at each individual stage perform these three main functions.

The function of checking laws is a model-form of initial knowledge about an object; model-diagnosis; model-retrostory.

Foresight function - forecast model; model-interpretation; model-project; criterion model.

Explanatory function - model-research; idealization model; model-adaptation; model is another reality; model is a new form of knowledge.

One of the main tasks of such structuring of model forms is, in our opinion, limiting the diversity in cognizable educational systems. The analogue model, without violating the

Western European Journal of Modern Experiments and Scientific Methods
Volume 2, Issue 2, February 2024
https://westerneuropeanstudies.com/index.php/1
ISSN (E): 2942-1896 Open Access| Peer Reviewed

objective diversity inherent in the original system, seems to determine its most relevant aspects that require display at a specific moment in the experimental work. Since it is well known that with an increase in the information capacity of a model, its heuristic efficiency does not increase in direct proportion to the amount of information taken into account, but according to an extreme law, that is, up to a certain limit, after which the effectiveness of a given model decreases and it is necessary to move on to another.

The conducted research allows us to note the sharply increasing importance of the heuristic role of educational models, which is associated both with the growth of their theoretical significance and with the transition to the operational level of their technological support.

List of references

1. Абрамова Н.Т. Кибернетическая модель и построение теории: Эксперимент, модель, теория. - М.; Берлин: Наука, 1980. -188 с.
2. Буш Р., Мостеллер Ф. Стохастические модели обучаемости.- М.: Физматиздат, 1962.- 483 с.
3. Anarkulova G.M. Scientific and methodological foundations of a competent approach to the training of teachers of special disciplines of the vocational education system. Journal. ACADEMICIA: An International Multidisciplinary Research. Year : 2022, Volume : 12, Issue : 5
4. Anarkulova G.M. Practical educational methods in teaching the topic on amplifiers. Journal. “Science and Innovation. 2023 /5/20