ANALYSIS OF MODELING AND DESIGN TECHNOLOGIES OF SYSTEM-EDUCATIONAL FUNCTIONALS

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Summary

The work presented for discussion by the pedagogical community discusses the technological algorithm of modelling and design procedures, as well as their identical or different characteristics, organizational features and resulting capabilities. Practically performing a single research function in terms of predictive analysis of the behavioural trajectory of a given system functional, the modelling and design processes have somewhat different end products: a model and a project. Thus, it is reasonable to recognize that while the model provides an opportunity to study a real system functional on the basis of its simplified model copy, the project provides for the compilation of an existing algorithmized technology for studying a real system functional with sequential execution of a set of tasks.

Considering the specific features of the application of modelling and design procedures in the education system, it makes sense to note that since this construct is classified as complex and multi-vector system organizations, the actual and full implementation of procedural modelling or design tasks in the field of educational activity looks like a difficult task, which will require a thorough study of the characteristic attributes and properties of an analogous object, the dynamics of its structural transformations and the influence on its activities of certain factors of endogenous or exogenous origin, the relationship and mutual influence of components and individual elements, the synergistic effect in the course of identifying the target capacity of such an object.

Key words: modelling, design, technology, system educational functionality, model, project.

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1. Introduction

When studying the problems of modelling in the philosophical plane, it is appropriate to note that the meaning of the given technique is based on the impossibility of the human mind comprehending the variety of signs, features and characteristics of phenomena, processes and objects actually existing in the environment *(Kulchytsky, 2015:273)*. Thus, in the course of cognition of the surrounding reality, human consciousness singles out the most accessible features of the studied phenomena, processes or objects, synthesizes them into a certain visual image and analyses it from the position of subjective utility. According to the above, the object of study acquires the configuration of an impoverished copy or model of a really existing formation (an analogue object), which significantly facilitates and accelerates operations regarding its essential cognition.

In the above trajectory, the concept of "modelling" should be understood as a method of perceiving the objective world, in which the object of study existing in the real environment is replaced by its abstract-imaginary copy or model *(Modern dictionary of foreign words, 2006:461)*. The term "model" in the given context should be recognized as an artificial copy of some process, phenomenon, object in a simplified interpretation for the purpose of their study, research and/or explanation *(Dictionary of the Ukrainian language, 1973:776)*. Accordingly, it is relevant to consider the system model as the so-called "provider" of information regarding a practically functioning system (its objects), with the help of which the researcher, who actually forms the model, based on the goals and objectives of scientific research, gains the opportunity to study the system object and form prognostic diagnoses regarding the stability, usefulness and effectiveness of the original system.

At the same time, the demand for design arises under such conditions when there is an expediency of transition from a functional model of a system object to a prognostic model, that is, to the development of a project, the implementation of which should allow for an increase in the qualitative characteristics of the system object in the long term. Thus, it turns out that design is a systematic scientific and practical activity in the trajectory of solving problem nodes of educational functionalities with the help of prediction and forecasting tools *(Ryabova, 2012:6-7)*. In this way, projects, like models, are formed in sequential stages that provide for its compilation and implementation.

2. Characteristic features of modelling and designing

In the context of carrying out complex innovative and reformist transformations, it is important to choose such a prognostic and functional list of actions that would best correspond to the goals and objectives of the outlined local ideas or large-scale plans. According to the analysis of scientific and methodological explorations, mechanisms for step-by-step implementation of a set of ordered measures, which in a descriptive and practical sense have the ability to be characterized by the concepts of scientific benefit: "modelling" or "design", can act as a necessary research tool?

The direct modelling process is defined as a set of stages or steps to create a copy object similar in features and properties to the prototype object. The following system positions are generally recognized stages/steps: awareness of the task, formation of a model, verification of such a model for reliability, selection of a design method, etc. The final stage in modelling is the fact of organizing an effective, comfortable and practical model of the studied system-educational functionality.

At the same time, according to scientists, a system model of a complex original object, in order to facilitate its use in solving research problems, must meet such unique criteria as: stability, simplicity, adequacy, efficiency, universality, intellectuality, openness, flexibility, manageability, sensitivity, etc *(Hryb, 2019:65)*. The mentioned properties of the system model will not only really contribute to increasing its consumer appeal, but will also enable the technologization of the illusory model in terms of developing a step-by-step algorithm for its construction or reconstruction.

When studying the problem of reorganization of the model in accordance with the procedure for reforming an analogue object, it is necessary to take into account the time factor, which in one way or another, due to the action of objective or subjective factors, has an impact on the functional capabilities of a really operating analogue object. Therefore, in order for the system model to maintain its current relevance and objectivity, it must be adjusted by the researcher through the transformation of its structure, content or form in accordance with those transformations that have had or are manifesting in the general space of the functioning of the analogue object. By ensuring constructive synchronization of the functionality of the original model and the construct of the copy model, it is always possible to achieve a decrease in the threshold of sensitivity of research results to transformations of system factors in real time, which actualizes the effectiveness of the involved model or design tools in the course of their systemic technologization.

When considering design as a specific type of human activity, modelling should be perceived in the form of its basic part *(Ryabova, 2012:6)*. It follows that a comparison of the procedures of "modelling" and "design" reveals their interpenetration rather than their similarity. In other words, modelling is the primary and important link in the formation of individual models at different stages of design, while design itself can be extremely useful in considering the dynamics of model development.

The active use of design in educational activities is determined by the fact that, unlike the past or present time frame in which the modelling procedure should take place or is taking place, which is aimed solely and exclusively at reproducing a once functioning or currently actually operating process, phenomenon or object, the phenomenon of design activity in the education system is aimed at achieving the result that will be provided in the future on the basis of the developed project. At the same time, modelling is based only on past experience and proven achievements, while design, according to its designation, is engaged in the search for innovative ideas, modern methods and progressive technologies, which, in fact, determines the place of this scientific approach in educational practice.

3. Technologization of modelling and design

Modelling and design are effective means of studying environmental objects and are considered today the most substantiated and effective methods of studying phenomena or processes of any nature from the chosen field of social activity. At the same time, taking into account the global processes of technologization of various branches of human relations, the modelling procedure acquires the features of technological support, which finds its manifestation through a modern tool called "modelling technology".

Thus, it is beneficial to resort to the technologization of modelling or design in those situations when the spatial construct in which a real (material / virtual) object functions is a complex, dynamic and unstable formation. Therefore, the meaning of the word formation “spatial construct” is considered as a set of exogenous (external) and endogenous (internal) factors that can contribute to or hinder the effective functioning of the object under study. At the same time,

the external network of factors usually includes political, economic, environmental, social or territorial conditions of the object's existence, while the internal factors are relevant to include the structure, content and format of the system-object formation.

Thus, it is logical to recognize some similarity between the concepts of "technological modelling" and "project modelling", because the project approach, as well as the technological one, directs the researcher to search for an algorithmic sequence of actions in terms of creating effective mechanisms for organizing, ensuring and supporting some, actually operating, system functionality. Therefore, it makes sense to note that the project and/or technological approach interacts with the system approach, thus providing the central principles of systems theory, which relate to the integrity, hierarchy, certainty, reliability, completeness, variability and structuring of system formations.

By defining the fact that the design process involves the drawing or construction of something *(Dictionary of the Ukrainian language, 1976:177)* in the context of the formation of scientific knowledge and socio-production practice, as well as the exploration and practical implementation of effective ways of reforming complex systems and/or rational management of their structure based on modern information resources *(Bykov, 2009:177)*, It makes sense to recognize the modelling action as a prerequisite for the project stage, because such an option organizes the ordering of information and establishes a particular scheme of the sequence of operations performed by the researcher during the preparation of socially significant projects, including in the conditions of designing system-educational functionalities.

4. Conclusions

As a result of the consideration of modern procedures for modelling and designing system-educational functionalities, along with their essential similarity, it is necessary to recognize the dissimilarity of these tools in terms of existing information data and functional tasks performed. In this way, modelling has at its disposal past or present information about the characteristics of a real existing system object and tries to solve the problem of forming its artificial copy (model). Along with this, design operates in its activities with present information and future predictions about the functional capabilities of the system object and aims to solve the problem of its innovative modernization.

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