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EDUCATIONAL SYSTEM MODELLING: CONTENT AND TECHNIQUES

Annotation. The paper analyzes the shortcomings of typical building models of educational systems in research, theoretical position, which should be guided by the simulation provided practical advice simulation technology. The article describes the principle accurately reflect the pedagogical model of the" formation competency leaders of secondary schools", which is based on regulated materials technology research and approbation designs of educational systems.

Keywords: model educational system, methodology and its components, simulation technology.

The relevance of the issues dealt with in the article due to the low level of scientific substantiation of the content and structure of the educational sphere models proposed for experimental verification. Fine mapping system models in most cases a chaotic or disclose logic operation model of the structural components of the hierarchy and dynamics.

The purpose of the article - theoretically grounded technology of display models and educational systems based on the theory of modeling and systematic approach to research.

The main material. Within the system models where dynamic educational processes are structural components (subsystems), development formation, quality enhancement, the sequence of stages of models control process, their name, internal structure and content are often based not on scientific, universally recognized and experimentally tested so-called universal control cycle (planning, organizing, adjusting, analytic control and evaluation), but on the desire to “attractively” represent one’s view of the interrelation of the main system components.

Visual (illustrative) representation of system models suffers from overloading of secondary components, sketchiness or, vice versa, generalized

abstract components, that do not discover the modeling system content, do not overview its internal connections, functioning method and forms.

In our judgment, this comes from the lack of young researchers' preparation for modeling as a complex scientific technique. The place and role of a model in experimental research, scientific mechanism of an educational research are often defined as a goal, final result. That is fundamentally wrong.

In scientific and applied psychological and educational research the development of the system model that is under investigation, performs the main role (the research is impossible without it). But in fact, the researcher's main goal is creating a system: management, learning, education, guidance, professional development, etc. To achieve this goal it is necessary to develop science-based hypothetical model of a desired system, that is intellectual author's concept of an integrity, its structural components and functioning conditions, that help to improve the efficiency of education, management and guidance in case it is implemented. The main goal of the model creation process is its suitableness for experiment and practical test of the concept, scientific statements, technological groundwork and author's propositions. It requires accurate linguistic and illustrative representation of the consistent organization of implementing the proposed concept into educational process, evaluation of the on-going and resulting information about the results of the model test, in case it is necessary to adjust the model components.

The development and practical test of the hypothetical system model is not the goal but the main task of educational scientific and applied research. When the quality of results of the hypothetical model testing is positively summed up and analytically proved, this model acquires the status of a system.

The main goal of modeling is creating the working analogue, ultimately close to the existing original or its intellectual imaginary representation in a verbal, diagram, illustrative, three-dimensional, static, dynamic or other form. The model must represent as full as possible the picture of the existing or imaginary intellectual (ideal) object, process, etc., that is systemic. Any model will always be

more simplified, poor, more sketchy compared to the original, except for exemplary models, created in order to function as examples necessary to follow. The model is always somewhat abstracted away from concrete external and internal features characteristic of the original system.

Viewing the system as a philosophical and scientific category is one of the leading technological issues of modeling, because everything we deal with socially, environmentally, at work, in everyday life, in private life, is three-dimensional: chaotic (in disorder), systemic (integral, in order) and the one in-between – transitional. We can model mostly systems, but for experimental purposes phenomena and processes can be modeled, too. The ones that are on the stage of formation or development and have some characteristics of a system, although have not become the system yet.

It is practically very important to realize what phenomenon, process or object we deal with (systemic or chaotic), especially regarding that chaotic processes and phenomena are uncontrolled and are almost inappropriate for modeling.

In order to clearly define what phenomenon, system or other state we deal with, we must rely on the knowledge of features compulsory characteristic of any system: technical, eco (biological), social. These features are: goal, tasks, functions performed by a system; structuring of a system into separate interrelated components; hierarchy (subordination) of all the system components; interplay and high quality interrelation among all the systems; interrelation with the more general systems and their determining impact on smaller systems; conditional boundary; striving for initial chaos; availability of the component that stabilizes (prevents from) collapse, striving for chaos, and directs. That is control system. The absence of any above-mentioned compulsory universal system features violates its integrity, results in instability, collapse, provides ground for affirming that the phenomenon, process, object, etc. that is being discovered is not a system (integrity), makes direct control of it and goal seeking impossible. For the sake of this goal the conditionally called “system” is created.

System modeling requires: appropriate methodological and theoretical statements, in particular, dialectical laws; realizing the integrity and interrelation of life phenomena and objects, nature and society, thinking and actions. The model should be goal-seeking, primarily representing the goal defined for a hypothetical system that is being modeled, must include the tasks, methods, means and conditions needed to achieve the goal, that is to achieve the predicted, expected final result.

The model should be rather solid (concentrated), represent particular connections among its basic parameters, structural components. The model should also represent the logic of stages (functions) of the movement control process from the goal to the result, have stage appropriate activity forms and methods for those participating in an experimenti. The model should provide a simplified, outlined representation of the basic features of the existing original (or of its idealized hypothetical idea), but simultaneously include as much information as possible about the content, external and internal connections, necessary for effective system functioning in accordance with the defined goal (expected final result). The science based model should be clear to everyone who participates in the experiment or is interested in it, describe the hierarchy and order of the system structural interaction, its purpose.

It is quite difficult within the modeling process to externally (visually) represent it totally and its sub-models (models of a lower level), that are structural components of the general model. Often within the modeling process researchers try to represent as many components of the modeled system as possible, and place them in the order that only their author can understand them, but not according to a well-founded concept обґрунтованої, illustrated in the manuscript (if it exists).

Absolute majority of "models" does not meet general requirements for system modeling and hold up when analyzed. Different dashes, arrows and other signs, that are meant for illustrating the connections among the system components, are often inappropriate and behind their visual attractiveness does not have any scientific logic.

At their best, some given “models” are schemes representing some structural components of the investigated systems.

The existing scientific and technological problem of modeling can be partly solved on the basis of theoretically reasoned, unified technique constructing models of corresponding educational systems, defined and meant for experimental research.

Primarily, we base on a well-known but rarely implemented statement about the entity of the general and the particular, the entity and its parts. Every author is creating his own model, different from others. Ex facte, it is positive. Although we should remember that every system model has such components as an object, subject, objective, tasks, methodology, theoretic reasoning, content, forms, methods, means, conditions, activity objects and subjects, its structure and some dynamic (procedural) fundamentals of attaining the objective, that is built on the logic of universal management cycle stages, and also the final result. The mentioned components, general for every research (but their content differs in every separate case, that identifies the authors), have scientific novelty, theoretic and applied importance. The placement and representation of these model components is that difficult for many researchers, especially beginners. We consider it appropriate and correct to use the universal modeling technology (referred to the author). We offer a possible, experimentally approved, in our judgment, rational way of building system models in scientific and applied educational research.

It is appropriate to assume such integrated structural components (cells, modules etc.) as a basis:

1. Objective-setting component including: social reasoning of a problem, defining and reasoning of the objective, developing tasks.

2. Theoretic and methodological component including: vision making (philosophical), general science (theoretical), legislation and normative, research concept (if any), tendencies, regularities, principles, particular theoretic foundations of functioning of the system under consideration.

3. Content component including: basic research areas, target functions, research content.

4. Organizational and structural components including: subjects, objects, conditions, organizational research structures.

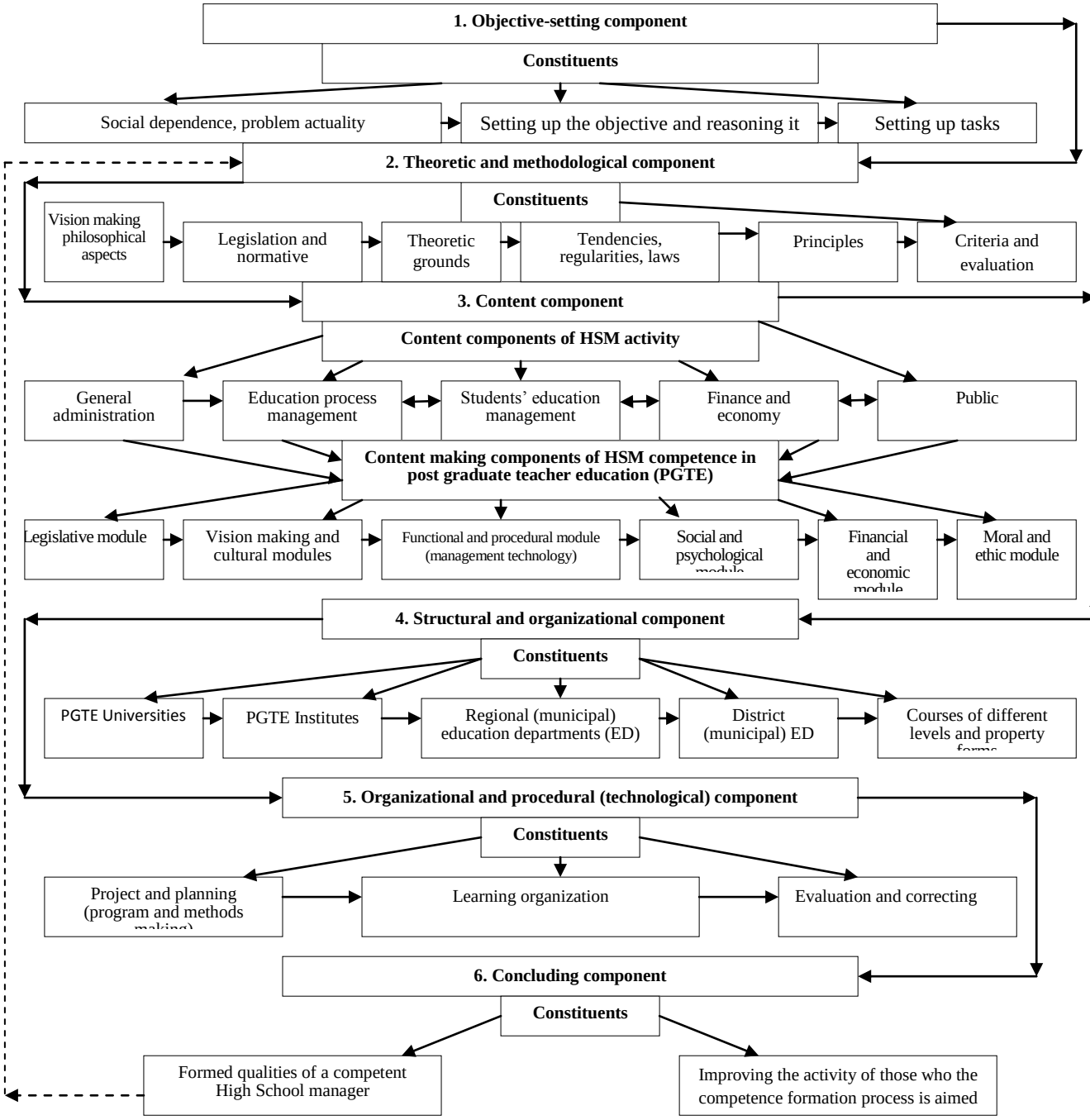
5. Procedural and technological components (stage functioning) including: predictive and projective, organizational and regulative, analytic and concluding (other function names are possible) and relevant forms and methods of their implementation.

6. Concluding component: developed skills of education subjects and objects, changes of the management system and work functions, support and conditions.

We consider it appropriate to describe the content of the structural components in more details taking the example of forming the employment functional competence of high school management staff in post graduate education, that is described in a corresponding model of this system.

The objective-setting component determinant and system-making for the model, because all the other components, represented in it, should be aimed at seeking the determined objective, that is the outcome, which the hypothetic (that does not exist yet) system model is aimed at. The basic constituent of the model objective-setting component is the goal. To define the goal we need to single out the problem as a contradiction between social needs, status and opportunities to satisfy them, remove or reduce the existing contradictions, prevent destruction processes. To define these contradictions (to formulate the problem), we need to analyze the existing particular objective needs and the level on which they are satisfied. Analytically defined and formulated problem permits, on its part, to reasonably define and formulate the goal as the desirable outcome of functioning of the created model. But the outcome is a long-lasting, possibly long-term process, that has certain stages, conditions and forms of activity, formulated as tasks. Solving them influences the quality of the outcome, that is achieving the

goal. The quantity and content of the constituents of the objective-setting model component depends on its complexity and goal.



The Model of Forming High School Managers (HSM) Competence

The second model component is theoretic and methodological. Any leading activity (and not only it) is based on some philosophy that defines the person's vision level and on the corresponding legislation.

Other constituents of the theoretic and methodological component as its general scientific constituents are leadership and management theories (tendencies, regularities, principles).

The third model component that logically results from the previous two is its content. In some models content takes an obscure secondary place of representation after different organizational structures and functions. We should realize that the content of any learning activity results systematically from its goal and is the foundation of the models that represent the formation process, the development, the improvement and correction of professional skills and competence.

The constituents of the content making model component are defined after analyzing the content structure and conditions of a person's activity. In our opinion, the content of school management can include the following integrated directions: learning process management, pedagogic upbringing management; general administration; finance and economy; job training; representation and image making of the institution etc. Certainly, other approaches to structuring the content are feasible.

The next model component is structural and organizational. It should represent the subjects (those institutions or people), the objects (people, institutions, bodies) that are model components, their group work relations, and conditions under which it takes place.

The fifth structural component is organizational and procedural (related to learning technology) that is the dynamic foundation for any model and should represent the stages of the model operation process (its functioning). Its basic constituents (according to scientific management regulations) are: developing and approving resolutions (modeling, planning, project design etc).

The concluding model component is objective and subjective outcome when general outcomes and the effectiveness of the tested model are analyzed and evaluated according to the following parameters: the quality and competence level

of high school managers, qualitative changes for improving the professional skills of teaching staff and managing the subjects of competence making process.

The criteria foundation for evaluating outcomes can be developed and placed within the theoretic and methodological model component if it has independent, sufficient theoretic grounding or the organizational and procedural component if the criteria foundation for evaluation are borrowed techniques and technologies.

The arrows (solid ones) that connect the structural components of the suggested model point at the sequence of their relations (according to hierarchy demands as a basic characteristic and principle of the system approach), the broken arrows represent the relation between the goal and the outcome that do not conclude with competence making of high school managers. Conversely, amendments to all the components and their constituents are developed on the basis of outcomes analysis. That means correcting them in order to improve competence making of high school managers.

The suggested unified structure of the model design logic of education systems and the form of representing them do not pretend to be categorical. There certainly may be other approaches and forms, representation of the content of basic model components, but they should meet basic requirements for developing and sequence of illustrating models of such level.

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