

Model of mathematical competence formation of technical specialties students in the conditions of inclusive learning

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Abstract

The question of application reasonability of a modeling method in the inclusive learning branch was considered. The organization model of the inclusive learning of physical and mathematical disciplines for disabled students was suggested; this provides the formation of mathematical competence. The components of this model were defined and theoretically proved. The purpose and task of the investigated model implementation was formulated. Process of selection of mathematical discipline subject matter is described. The data on forms, methods and means of inclusive learning of physical and mathematical disciplines for special needs students are given, and specifics of their use are defined. The attention is focused on features of process of educational achievements control of disabled students in conditions of inclusive learning.

Key words: MATHEMATICAL COMPETENCE, INCLUSIVE LEARNING, DISABLED STUDENT, TECHNICAL HIGHER EDUCATION INSTITUTION, LEARNING MODEL

Modern information-oriented society lays down high requirements to graduates of higher educational institutions; these requirements consist not only in knowledge and skills acquirement, but also ability and readiness to solve professional, social, personal problems effectively in the conditions of market economy. Important component of professional training of technical HEI student is physico-mathematical education, which provides mathematical competence acquirement. At the same time, it is possible to establish the fact that process of formation of disabled students mathematical competence in the conditions of inclusive learning is in need of improvement. Therefore, there is a need of developing of the corresponding learning model, which will increase this process productivity.

The detailed analysis of works from the general modeling theory (V. Afanas'ev, V. Shtoff et al), mod-

eling in pedagogics (G. Ball, V. Bespal'ko, K. Vazina, O. Dakhin, V. Davidov, V. Mizintsev, V. Slast'onin, Ye. Yudin et al), and also scientific researches from a question of students mathematical competence formation (D. Gel'fanova, L. Ilyashenko, O. Komisarenko, V. Plakhova, G. Seraya, Ya. Stel'makh et al) were before building of the model of the inclusive learning organization of physical and mathematical disciplines for disabled students in technical higher educational institutions.

"Model" is a key concept of the modeling theory. O. Dakhin has suggested the most general definition of model. From his standpoint, it is artificially created object in the form of the scheme, physical designs, sign forms or formulas, and being similar to the investigated object (or the phenomena), it displays and recreates structure, properties, interrelations and the

relations between elements of this object in the simplified and more common form [3].

N. Yakovleva determines the specifics of pedagogical modeling. First of all, the pedagogical modeling is implemented in the conditions of pedagogical process. Secondly, its purpose is improvement of educational process. Thirdly, objects of pedagogical modeling are not material. Fourthly, the developing object is the result of pedagogical modeling (pedagogical model) [5].

The last statement can be described by the fact that, as E. Lodatko emphasizes, the gained knowledge of the investigated pedagogical phenomenon (object or process) cannot be definitive and exhaustive due to uncertainty and vagueness of pedagogical concepts, lack of the acceptable measurement mechanisms of the personality development during learning, students educational achievements and so on. According to the scientist, the only real opportunity for learning of the pedagogical phenomenon (object or process) is its formalization (schematization and simplification) by means of detachment and investigation of its critical characteristics, which are subjected to the analysis, evaluation and administrative influence [4].

On the one hand, scientists experience shows reasonability and efficiency of use of modeling method in pedagogical science. On the other hand, the question concerning creation of model of physical and mathematical disciplines inclusive learning organization for disabled students remains open and requires careful investigation. It predetermines the necessity of developing, theoretical underpinning and experimental validation of this model, which will be based on ideas of inclusion and consider learning specifics in the technical higher educational institutions. This model implementation will provide successful formation of mathematical competence of students with health problems. Therefore, the developed model underpinning is the purpose of article.

The model of the inclusive learning organization of physical and mathematical disciplines for disabled students contains four interconnected components: target, semantic, operational, control evaluating.

The target component is backbone and displays the purpose and task of the process under investigation. The effective organization of the physical and mathematical disciplines inclusive learning for disabled students is the purpose of implementation of the model suggested.

Let us note that the system, personal oriented and competence-based approaches to inclusive learning organization of the physical and mathematical disciplines for disabled students are the basis for building of model under investigation. Developing of suggest-

ed model is also based on the specific didactic principles of the inclusive learning organization of physical and mathematical disciplines for disabled students. They are the following: the principle of learning humanization, the principle of availability of educational services, the principle of flexibility and openness of learning, the principle of systemacity, the principle of an individualization and differentiation of learning, the principle of developing context, the principle of professional orientation of learning, the principle of innovation and scientificity.

As approaches and principles are determined at the stage of objectives definition, their reflection within a target component is reasonable. However, let us focus attention that approaches and principles, which are closely connected with other components of the model under investigation, determine these components.

Passing through a prism of these approaches to the inclusive learning organization of physical and mathematical disciplines and the principles of its implementation, the purpose of model introduction is transformed, becomes more concrete and provides formation of mathematical competence of disabled students in the conditions of inclusive learning.

On the one hand, the semantic component reflects the contents and structure of mathematical competence of the student of technical HEI (motivational and valuable, cognitive, operative and reflexive components), and on the another hand, the maintenance of the corresponding subject matters. Selection of the content of mathematical discipline must be carried out considering the relevance of educational data and according to requirements of modern information society. In other words, the maintenance of a subject matter is determined by the set of mathematical knowledge and skills, which the student should possess for successful solving of the tasks, which can emerge in the further work activities.

Scientists researches show that improvement of the content of the corresponding mathematical disciplines considering the requirements of concrete special field and intensification of a professional orientation of mathematics learning [2] is one of the main directions of increase of mathematical training level of HEI. Respectively, selection process of the content of mathematical discipline consists in implementation of the following steps: the analysis of the learning content provided by industry standards of specialists training and the typical program of the corresponding mathematical disciplines; composition of course working program; careful selection and structuring of training material of mathematics course, in particular creation of system of professionally directed examples, tasks for development of abilities to use mathe-

mathematical methods and to prove their expediency during the solution of professionally directed tasks.

Therefore, the system of professionally significant knowledge and abilities, which will be conducive to mastering of special skills typical for the concrete expert profile, must be the basis for the content of mathematical discipline.

The operational component of model provides implementation of a definite purpose because of application of the corresponding methods of learning (research method of study, method of a problem statement, method of projects and so forth), introduction of certain organizational forms of learning (traditional, electronic, remote), use of various means of study. The distribution of information and communication and adaptive technologies gains the special importance [1]. They create additional opportunities for satisfaction of special educational needs of students.

The necessity of individual trajectories creation of inclusive learning for disabled students is specifics of model component implementation in practical activities. It provides adaptation of forms, methods, technologies and means of learning according to health condition of this category of students, features of their psychological development, possibility of training material perception, abilities to information exchange, possibility of visiting of classes and so forth.

The control evaluating component is focused on clarification of model functioning efficiency of inclusive learning of physical and mathematical disciplines for disabled students. This component provides control, evaluation and analysis of results of students educational achievements, disclosure of deviations from desired goal, the reasons of their emergence and entering of necessary adjustments educational process organization.

The control actions are carried out by means of oral, written, laboratory, practical works, in the form of examination and tests. Students self-checking plays an important role. The main function of control is providing of feedback between the teacher and the student.

The teacher and the student receive information on the level of difficulty of certain kind of activity, typical mistakes and shortcomings, which identification allows constant improving of educational process, planning of further study with introduction of corresponding changes.

The teachers evaluation of educational activity results of students must be systematic, consecutive and objective. Multidimensionality of evaluation process is its complexity. So, on the one hand, the evaluation must be correct from the teacher standpoint, on the other hand, it must be fair according to the student,

and thus, correspond the standard criteria.

The problem concerning control and evaluation of educational achievements of pupils and students, in particular during studying of mathematical disciplines, is considered by scientists from different aspects (V. Avanesov, V. Bykov, V. Klochko, O. Kondratieva, Z. Slepkan', O. Charkina). However, features of control and evaluation of disabled students are almost not investigated. At the same time, it is difficult to deny their existence. Process of educational achievements control of disabled students in the conditions of inclusive learning has its specifics.

As was mentioned above, the educational process must be adapted in a certain degree for special requirements of this category of students. However, not requirements to the disabled student but conditions, in which such student will show the abilities and educational achievements, must be subjected to adaptation.

Let us emphasize that special conditions (increase in time allowed for the solution of a task, permission to use of the computer or specialized technical means and so forth) must be created not for the sake of accordance of a special privilege to students with health problems, but for equalizing of their initial opportunities to students without physical limits opportunities.

Respectively, the selection of the appropriate monitoring system of educational activity results of students with health problems, providing equal opportunities for students with limits and without them, and objective approach to knowledge evaluation and abilities of all the students play an important role during mathematical competence formation of students of this category.

In the suggested model, the control evaluating component is characterized by criteria (motivational and valuable, cognitive, operative and reflexive), indicators and levels (low, medium, sufficient, high) of formation of mathematical competence of disabled students.

Therefore, the inclusive learning organization of physical and mathematical disciplines for disabled students in the technical higher educational institutions consists in mathematical competence formation of this category of students and provides the corresponding model of learning implementation. Prospects of further researches are related to experimental test of efficiency of the developed model during its introduction into activity of technical higher educational institutions.

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Teaching System Based on Intelligent Computer Assisted Instruction

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Abstract

ICAI (Intelligent Computer Assisted Instruction, hereinafter referred as ICAI), is a teaching mode on the theoretical foundation of the cognitive science and thinking science, through the study of the characteristics and process of the thinking of human in learning, with the application of the