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HUMANIZATION OF SCIENCE AND MATHEMATICS EDUCATION IN THE CONTEXT OF INFORMATIZATION

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Abstract

The article reveals the humanistic orientations of the science mathematics education of students with the development of informatization of education. The relationship between the latter and humanization of science mathematics education of students in higher education is presented: the development of students' intelligence is set as a pedagogical goal of humanization in science education; meanwhile the means of solving the problems of humanization of education become a complex use of computers in the educational process. New information tools accelerate the delivery and processing of educational information, become powerful tools for ensuring the interaction of participants at a distance, enhancing the visualization of educational materials in the process of learning along with checking the way the material is acquired. The students, their development and self-realization are the goal of all organizational and structural changes in the system of education. Different levels of cognitive abilities and skills of students, as a result of the increased internationalization of students, the presence of initial language difficulties for foreign students, the introduction of inclusive education into the vocational training system encourage applying the techniques of adaptive learning technologies and introducing individual learning technologies. Humanization of education is viewed as value-orientation linked to the restructuring of teachers' approach in education towards to individualization and differentiation of learning process, that aim at the development of students' abilities and self-realization in a changing world. Science and mathematics education of students is based on fundamental education; however, to achieve educational goals it is essential to include practical tasks.

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1. Introduction

At the turn of the 20th and 21st centuries, there was a transition from the industrial stage of social development to the post-industrial or informational stage, marked by the intensive development of computer and telecommunication technologies and the creation of a developed information environment (Ibragimov, 2008). Structural changes in society based on new technologies required the transfer, storage and exchange of information and were thus accompanied by the introduction of synergetic ideas that have a scientific basis. These changes in the educational domain affected the revision of science education, the forms and methods of organizing a complex, open and non-linearly developing educational system (Perminova, 2004; Solodova, 2016). Hence, the examples of such changes have included the increased learning variability, abandoning of authoritarian ways of managing the educational process, the dialogue has become the means of communication among its participants in the educational process, justification of the effectiveness of “soft” management. In the implementation of innovative strategies of computerized education, a big role of computer technologies is noted in the expansion of human capabilities (Broks, 2002). The influence of humanistic ideas on the change in the educational process and the formation of students' competences in education is the topic of research by foreign educators (Keck, 1998; Anderson, 2018). The student becomes a key figure in modern university education, with their self-realization and self-development, mastering professional competences, socially significant skills and abilities. These humanistic positions are reflected in the Federal “Law on Education”, the preamble of the Law reflects the focus of the educational system on self-development and vocational guidance of students (Federal Law of 29.12.2012 No. 273-FZ (as amended on 12/25/2018) “On education in the Russian Federation”. URL: http://www.consultant.ru/document/cons_doc_LAW_140174/ (Date of retrieval: 03/03/19)), the Federal State Standard of Higher Education (FSSHE) of the new generation proposes new requirements for the development of adaptive educational programs for people with disabilities, the development of Inclusive education becomes an important criterion in the evaluation of educational institutions. A tool that facilitates the teaching process and the process of obtaining, mastering and applying knowledge by students is the informatization of education. Each participant in the educational process can partake in the communication at significant distances, take part in videoconferences, receive education in a distant form, while the teacher is released from the mundane examination and assessment of knowledge. Multimedia tools and technical instruments make it possible to study complex processes in the sphere of natural science, save study time, vary the learning process with visualization tools, and make mathematical modeling real. The utilization of different forms of knowledge representation makes mathematics livelier and more meaningful in the study of life and in the research of any phenomena of nature.

The methodological basis for updating the content and methods of studying natural science disciplines in the information space of a university is the humanistic dominant, which involves the creation of conditions for the development and realization of cognitive needs based on interests and abilities of students. Humanization is viewed by researchers as the goal of education, a way of transmitting universal values into education and as a deterrent to the development of technocratic thinking in the context of growing informatization and technologization of education (Kuznetsova, 1998).

2. Problem Statement

We consider the following tasks to be priorities in the current study:

1. Identification of the most significant factors influencing the humanization of science and mathematics education in the conditions of informatization of education in a regional university;

2. Determination of ways to solve the emerging problems of humanization of the educational process in connection with ever-increasing ratio of international students, ensuring the quality of students' knowledge and skills with the informatization and technologization of science and mathematics education of students in a regional university;

3. Presentation of research of a regional university in solving educational problems in teaching students of science and mathematics majors, which include:

A) the study of the foreign students adaptation to the educational process at the university, the research into their motivation to study natural sciences, the study of the main difficulties in science major acquisition.

B) strengthening practice-oriented teaching of mathematics to students of sciences, the development of distance learning for a multi-level student body.

3. Research Questions

In order to solve the set tasks we have formulated the following questions:

- What factors have the greatest influence on the current state of science and mathematics education?
- What characterizes the current stage of the development of science and mathematics education and what is the role of the humanization of science education in the context of the complex use of computer tools?
- What are the ways to solve educational problems caused by the strategy of humanization in science and mathematics education?

4. Purpose of the Study

Identification of factors affecting the humanization of science education in a regional university and how to solve them in the time of informatization of education.

5. Research Methods

The theoretical and methodological basis of the research falls back on the analysis of literary sources, scientific works on the problems of adaptation of university foreign students, on the issues of practice-oriented learning. The following methods have been made use of in the course of research: general scientific methods of analysis and synthesis, surveys, methods of analyzing students' motivation, analyzing the results of processing the obtained data.

6. Findings

The growth of the volume and complexity of educational material in natural sciences, the increasing requests from employers and society for graduates considering labor market instability and the volatility of some professions, the training of multi-level students associated with the increasing internationalization and the implementation of inclusive education - these factors determined the search for optimal educational methods, tools and technologies. Science and mathematics majors do not enjoy the same level of admission competition to the university, and prestige of the future profession is lower than in socio-economic and humanities majors. This is evidenced by the dynamics of admission of applicants to the relevant majors. We took into account different levels of students and used methods of tailoring educational material by introducing adaptive techniques that allow for a gradual increase in the pace of instruction, the volume and complexity of information, using educational material in different presentation forms (Vasilyeva, Khondyaeva, & Tugulchieva, 2018).

Mathematics researches forms and relations of the real world (natural science component), operates with "rational" methods, and is the basis for obtaining all possible professions in natural science domain. A survey of students revealed a high dependency of success of mastering core major subjects and the degree of proficiency in mathematics. Ensuring students' understanding of mathematical concepts requires the use of techniques and methods for visualizing mathematical information, presenting it in various forms: verbal, graphic, analytical, and others using computer tools (Volkova, Vasilieva, Tugulchieva, & Khondaeva, 2018). The choice of a practice-oriented approach to the selection of tasks for students is aimed at increasing the cognitive interest of students and the motivation to master mathematics and natural sciences. The outcomes of the present study are reflected in the publications (Tugulchieva & Vasilyeva, 2017; Volkova, 2018).

The educational space of a higher educational institution that is supposed to ensure comfortable and intensive learning process accelerates the exchange of information, while the management of the learning process makes it more instrumental. E-learning and distance learning technologies are an opportunity to study at any convenient time and place (Osipova & Soloviev, 2013). Internet resources, e-books, educational films and audio recordings are used, the informatization of education allows for communication with fellow students in specialized forums and consulting with a teacher. Kalmyk State University uses the LOTOS system (Person-Oriented Testing Teaching System) both for the faculty and students as a distance-learning tool.

The faculty members post the contents of subjects, including lectures, materials for preparing for seminars and tests, glossaries of terms and recommended literature for students. Such forms of distance learning appeal firstly to part-time students, students with absenteeism due to their health condition, and those who need a slower pace of acquiring the material. This category of students includes foreign students who go through quite a difficult period of adaptation to new environment: social, communicative, and educational conditions. Therefore, the humanization of education is necessary. Teachers and students both have important roles in classrooms, so this study investigates methods of humanizing education, in terms of teacher-student interaction. It is hoped that this study will give teachers a greater understanding of the essence of education to become better educators and that education will be humanized, so that students can develop a healthy body and mind and become better citizens in the future

(Yi-Huang, 2018). The adaptation of foreign students lies within the scope of the current study. We have identified the main difficulties of students with the general core subjects, and the leading role of mathematics for success in the students' record.

Subjective and objective factors have significant impact on successful adaptation of foreign students. Among subjective ones are "cultural background" and personal characteristics (adaptive potential), socio-psychological characteristics of students (Glass, Gómez, & Urzua, 2014). The duration of the adaptation period of international students in their freshman year depends on the level of their motivation to acquire a future profession. The main motives for studying are status motives, including the desire in the future to get a prestigious and well-paid job, as well as to improve social position. The next motive is associated with the fulfillment of the duty to their family; the third place goes to the motive of responsibility before the state that covered the tuition expenses. The motive to learn the sought-after profession takes the fourth place. The results of the surveys demonstrate that the majority of students majoring in chemistry formed a fairly strong motivation to acquire the profession. Thus, 29.4% of students strive to become chemistry teachers upon their return to the homeland. Most of the students before admission to the university had clear ideas with regards to their future profession.

The conducted survey showed the need for the implementation of individual-differentiated teaching of students that takes into account the level of their basic chemistry training, language difficulties and adaptation to the educational environment of the university. Methodical techniques used by us in the educational process in order to adapt freshmen students are reflected in the publications.

The results of the study of adaptation problems of students set new tasks, including:

- the development of a system of diagnostic materials for studying the problem of adaptation of students and a system of assessment tools;
- the selection of teaching methods, taking into account the pace of the presentation of educational materials;
- enhancing the visualization of educational materials through presentations, graph charts, tables and other means;
- the use of techniques that require verbalization and expansion of the vocabulary of foreign students for the acquisition of natural science subjects;
- compilation of guidelines with a description of the methods used for the adaptation of first-year students to the educational process in natural science majors.

7. Conclusion

Changes in science and mathematics education in the time of informatization are associated with updating the content of the conceptual foundations of science, a wide use new information technologies, modern methods and teaching aids. The increasing requirements for acquired knowledge, skills and abilities of university graduates of mathematics and science majors require the construction of an educational process based on humanistic ideas and the choice of methods and techniques of adaptive learning technologies. The organization of the educational process, free from authoritarianism, rigid management and based on a common humane goal (preparing students for the profession, developing their abilities for self-realization) is conducted in the context of the active introduction of informatization

and technologization of the educational process. The current stage of the development of education allows for the use of these conditions to tackle professional tasks: developing multi-level activities, building an adaptive learning model, developing practice-oriented education, forming students' professional competences to prepare them for their future profession.

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