



Management and application of the method to practical tasks as the most important means of realization of the professional orientation of a mathematics course in the republic of Kazakhstan

Gestión y aplicación del método a problemas prácticos, como la herramienta más importante para la orientación profesional en el curso de las matemáticas en la República de Kazajstán.

AKHMETOV , Zhalgas 1; TOIBAZAROV , Darhan 2; SEITOVA , Sabyrkul 3; TASBOLATOVA , Ryskul 4 & YESSENGABYLOV , Ilias 5

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Contents

- 1. Introduction
- 2. Methodology
- 3. Results
- 4. Conclusions
- Bibliographic references

ABSTRACT:

The article deals with the theoretical and methodological foundations of management of the educational system. The article deals with the most important approaches to the study of the main methods of implementation of the professional orientation of mathematicians. Characterized and identified the process of solving practical problems as the most important means of implementing the professional orientation of the course of mathematics.
Keywords: education management, mathematics, solution of practical problems, professional competence.

RESUMEN:

Este artículo aborda los fundamentos teóricos y metodológicos de la gestión educativa así como los enfoques más importantes para el estudio de los principales métodos de orientación profesional de la enseñanza de matemáticas. Se caracterizó e identificó el proceso de resolución de problemas prácticos como una herramienta importante para implementar esta orientación profesional.
Palabras clave: gestión educativa, matemática, resolución práctica de problemas, profesionales competentes.

1. Introduction

The most important task of the modern school is to implement the Concept of education at the senior level of general education (Ivanov, S. I., 2018). A practical introduction into the main ideas of the Concept confronts the education system the problem of the orientation of its content,

forms, methods and means of education for the harmonious development of students to ensure the success of their socialization in the light of the real needs of the labour market and cooperation of the senior level of the school with institutions of secondary and higher professional education (State program of education development of the Republic of Kazakhstan for 2011-2020).

The study of the school course of mathematics in grades 10-11 plays a crucial role in the system of specialized training, as the universality of mathematical methods allows in the formal concepts of algebra, geometry and mathematical analysis at the level of General scientific methodology to reflect the relationship of theoretical material of various fields of knowledge with practice.

Therefore, the practice-transforming activity of management in the education system, as a manifestation of the functioning of the content of mathematics in high school, determines the importance of mathematics in the preparation of students to continue their education in the process of professional development (Akhmetov, Zh. and Seitova, S. M., 2017).

1.1. Degree of development of the study

Fundamental studies of many Russian and Kazakh teachers, psychologists and methodologists are devoted to the study of problems associated with strengthening the management system and the social function of the school mathematics course at the senior level, with the education of schoolchildren in the importance and effectiveness of the acquired knowledge. In particular, the role and importance of mathematics in the development of inter-subject relations and the formation of students' practical activities are considered in the works of Zh. Akhmetov (2018), S. M. Seitova (2018), D. B. Toibazarov (2018), Breitigam, E. K. (2000) and other researchers.

Aspects of formation of senior pupils' professional skills included in the educational and cognitive activities in the process of learning mathematics are considered in the research of Breitigam, E. K. (2000), Ivanov, S. I. (2018) and other (Akhmetov, Zh. and Seitova, S. M., 2017).

Analysis of the work of these researchers from the position of the selection means to establish the substantive and methodological connection of school mathematics with the professional component of education leads to the conclusion that this relationship is due to the applied orientation (Breitigam, E. K. (2000), Vladimirov, V. S., Pontryagin, L. S. and Tikhonov A. N. (1979) etc.). The main carrier of this focus is practice-oriented (applied and practical) problem Aralbayeva R. K. (2019), Sultanova G. S. (2019), Kerimbayeva R. K. (2019), Chsherbovskikh I. G. (2019), Gussenov B. Sh. (2019), one of the stages of solving them in the theory of enlargement of didactic units (Yakovlev, E. V. (2004)) is the drafting task (Akhmetov, Zh. and Seitova, S. M., 2018).

2. Methodology

The methodological basis of the study was the documents on improving the management system in the educational environment, the main provisions of modern psychology and pedagogy of higher education, revealing the content and ways of formation of professional skills in mathematics.

Method of research:

- conversation, questioning of pupils, students and teachers, supervision of educational activity of pupils and students;
- the analysis of practice - oriented tasks of 8 - 9 classes was carried out (Alimov, Sh.A. (2001) and Makarychev, Yu.N. (1999) textbooks);
- study and analysis of documents on education, psychological, pedagogical and methodological research problems of implementation of the applied orientation of the school course of mathematics (State program of education development of the Republic of Kazakhstan for 2011-2020);
- SWOT analysis of the structured management of the learning process of a mathematical course.
- qualitative analysis of the research results.

As examples, the problems of mathematics course 8 – 11 classes are taken.

3. Results

The introduction of conceptual changes in the policy of education requires understanding and specification of the results of these modern directions of its modernization. In addition, the practical implementation of any innovation generates a dialectical contradiction between the existing social - conditioned paradigm of the process (including educational) and the levels of readiness of the subsystems of this process, ensuring its functionality. In particular, modern

requirements for graduates of specialized schools, which are a subsystem of the education process, are based in the aspect of applied orientation not only on the general criteria of the volume and completeness of specific skills of the previous educational paradigm, but also on the individual characteristics of the subject, preparing for the implementation of future employment (Akhmetov, Zh., Seitova, S. M., Toibazarov, D. B., Kadyrbayeva, G. T., Dauletkulova, A. U. and Issaeva, G. B., 2018).

Analysis of normative documents of the Ministry of education and science of the Republic of Kazakhstan, psychological, pedagogical and methodical literature, as well as the results of research in the context of the above revealed the following contradictions:

- at the socio-pedagogical level-between the socially determined requirements of society to the school graduate, expressed, in particular, in the need for continuous improvement of skills, the ability to independently set and solve a variety of tasks of professional and life plan, and the lack of development of the use of pedagogical systems that ensure the implementation of these requirements.

- at the scientific and pedagogical level-between the need for specialized training in the school system and the lack of didactic means to implement professionally significant educational functions of the school course of mathematics, having an applied nature;

- at the scientific and methodological level-between the high didactic potential of applied and practical problems of the school course of mathematics and the lack of adequate pedagogical technologies for its implementation in the system of specialized training.

In the Republic of Kazakhstan, the progressive development and modernization of education are possible due to the understanding of the country's leadership of the need and importance of human capital development and comprehensive support in the initiation and implementation of reforms in the field of education. The authors propose a number of specific areas of improvement of the management system and the application of methods of solving practical problems to create competitive specialists of the new formation:

- 1) Pedagogical updating of teaching mathematics.

- 2) Modernization of training programs. It is impossible to dispute some significance of these goals, but strictly speaking, they cannot be called either modern or new. At the same time, it is absolutely impossible to hope to achieve at least one of them completely.

- 3) The authors were given their philosophical prerequisites to, on the one hand, to leave such an ideal ground for learning to search, such an inexhaustible storehouse of exercises, which is given, for example, Euclidean geometry, and on the other hand, to replace it with general questions of multiple and logical structures, that is, the material is poor enough in terms of pedagogy (Toibazarov, 2018).

- 4) Don't need to think, that knowledge standard mathematical structures exhausts math. Quite the contrary: these structures represent only the most superficial aspects of it.

- 5) The true problem faced by the teaching of mathematics is not the problem of rigor, but the problem of constructing meaning, the problem of ontological justification of mathematical objects and the management of the education system (Seitova, S. M. and Toibazarov, D. B., 2018).

- 6) The «warhorse» of authors is formalization, axiomatics and rigor. Absolute rigor can be achieved only by excluding content. Absolute rigor is possible only due to the lack of meaning. In practice, mathematical thought is never a formalized thought. A mathematician puts meaning into every sentence. Thus, the emphasis put by the authors on axiomatics is a distortion not only pedagogical, but also mathematical.

- 7) For example, Euclidean geometry is a natural intermediate (and may be indispensable) object between the ordinary language and the language of algebra. Geometry allows for a psychological flash of syntax without sacrificing the meaning always maintained by spatial intuition. It can hardly be recommended to exclude elementary geometry, replacing it with linear algebra, which is required by modernist dogma. This operation is psychologically unnatural because algebraic objects are too semantically poor to be perceived directly as a spatial figure (Karbozova, Zhanar Zh., Abdymanapov, B.Sh., Salbyrova, M.T., Oralova, S.Sh. and Gussenov, B. Sh., 2018).

The tutorial Alimov, Sh.A. (2001) quadratic functions and its applications dedicated almost the entire textbook 8th grade. Here, the authors propose a block to consider the quadratic function and its properties, and then the square inequalities, and problems with parameters, solved by plotting a quadratic function (Seitova, S. M. and Toibazarov, D. B., 2018).

In the textbook Makarychev, Yu.N. (1999) definition of the quadratic function is given in the 9th grade is offered to students immediately, then the special cases of the quadratic function and after directly the general form of the quadratic function. The authors pay attention to the solution of square equations and systems of equations (in particular, the graphical method), based on the properties of the quadratic function (Vladimirov, V. S., Pontryagin, L. S. and Tikhonov A. N.,1979).

Very little attention is paid to problems with parameters (Tab.1). Consider how many practice-oriented tasks are available in the following class 9 textbooks:

Table 1
The structure of practice-oriented tasks
in textbooks grade 9, by the hour

Authors	Number of hours on the topic «Quadratic functions»	Number of practice-oriented tasks
Dorofeev, G. V. (2001) and others	20 hours	№ 180, 192, 255, 256.
Makarychev, Yu.N. (1999) and others	29 hours	The textbooks consider the problem with the use of physical properties at the beginning of the study of the topic as an example.
Vilenkin, N. Ya. (2004) and others	25 hours	The textbooks consider the problem with the use of physical properties as an example.

Note: compiled by the authors.

From the textbooks we can see that the problems of practice-oriented very little and they are mainly considered as examples.

3.1. Management in mathematical education of Kazakhstan

1. Improvement of management in education, including the introduction of corporate governance principles, the formation of public-private partnership (PPP) in education.
2. Improving the system of monitoring the development of education, including national educational statistics, taking into account international requirements.

In educational institutions established boards of trustees (2015 - 45% 2020 - 60 %) (Aralbayeva, Ryszhamal K., Sultanova, Gulfariza S., Kerimbayeva, Rysty K., Chsherbovskikh, Irina G., Gussenov, Barkhudar Sh., 20019).

Heads of educational institutions have been trained and retrained in the field of management (2015 - 50 %, 2020 - 100 %) (Aralbayeva, Ryszhamal K., Sultanova, Gulfariza S., Kerimbayeva, Rysty K., Chsherbovskikh, Irina G., Gussenov, Barkhudar Sh., 20019).

Tough competition in the labor market requires mobility and dynamism of the education management system (Toibazarov, D. B., 2018).

The management of education will involve the general public - both pedagogical and different segments of the population.

In order to promote PPP (public - private partnership), the system of social contracting and mechanisms of state financing of non-profit non-governmental organizations in the form of grants or other mechanisms should be improved. Systemic funding for the non-governmental sector should be provided as the basis for long-term PPP arrangements.

Public participation at different levels of education management is proposed in the form of boards of trustees.

It is necessary to develop a mechanism for effective public participation of boards of trustees in the development of education.

The role of the board of trustees will be enhanced through the participation of parents paying for education, employers, non-governmental organizations in education and professional associations.

To ensure corporate identity and transparency in the management of the education system, boards of trustees in educational institutions, sectoral and regional training councils with the participation of employers should function.

In the field of educational work, it is necessary to take measures to improve the system of planning, monitoring, evaluation and control of educational work in universities, as well as to

strengthen the management structure.

It is proposed to carry out advanced training of managers of the system of pre-school education and training, secondary education on management in education.

For the introduction of modern management technologies should be regularly trained, retraining and advanced training of managers of educational institutions.

One of the principles of the quality management system in education is the principle of continuous improvement of the educational process, taking into account the results of monitoring.

In order to carry out systematic monitoring of educational results and social effects at the national and regional level, a unified system of education monitoring has been introduced in the form of an information base for management and forecasting of development paths. To achieve this goal, the national center for education quality assessment has been transformed into the national center for educational statistics and assessment (NCESA).

Since 2013, a collection of educational statistics has been published annually.

The assessment of the need for specialists of various profiles and levels of training is carried out on the basis of a system of monitoring, analysis and forecasting of the labor market, designed to develop mechanisms of state regulation and stimulate the training of specialists in the mathematical profile in accordance with the needs of the economy, management and social sphere of the country.

Guidelines for the use of the compiled problems in the lessons of mathematics.

The main task is to overcome as much as possible the shortcomings of cognitive activity, preparing students for life and activities in the new socio - economic conditions, to obtain a wider, vital information for further choice of profession, employment, free orientation in modern society and everyday life (Yakovlev, E. V.,2004).

The implementation of this task is impossible without the search and improvement of new methods, techniques and means of training, including mathematics. One of the ways to solve the problem of socialization of school graduates - VIII type to the conditions of modern reality is the introduction of the content of the course of mathematics problems of practical orientation — it is economic, vocational, social and other types of problems. The use of tasks with practical content helps to ensure a more informed mastery of mathematical theory and practice, creates conditions for the implementation of the connection of learning mathematics with life, the development of interdisciplinary connections and contributes to a more successful socialization of graduates in modern society (Tab.2).

The need for new approaches to the management of the process of teaching mathematics and, in particular, the solution of problems caused by changes in the content of education in modern schools, taking into account the update of socio-economic needs and conditions of development of society. The essence of this approach is to create a system of work based on solving problems with practical content in the lessons of mathematics. The idea is that the use of these tasks contributes to a more conscious mastery of mathematical theory and practice and will further influence the more successful socialization of graduates in modern society.

Table 2
SWOT analysis of the structured management of
the learning process of a mathematical course

Strengths	Weaknesses
<ul style="list-style-type: none"> * clearly defined priorities for the development of education; * increase in the network of pre-school and secondary education facilities; * availability of national and national centers for each level of education; * compliance of the structure of Kazakhstan's education with the International standard classification of education; * restructuring of technical and vocational education; * functioning of the national education quality assessment system; 	<ul style="list-style-type: none"> * insufficient funding for education; * low status of the teaching profession; * insufficient quality of teacher training; * shortage of highly qualified teaching staff; * insufficient number of specialists in the protection of children's rights; * poorly developed management in education; * insufficiently developed system of public-private partnership (hereinafter-PPP) in education; * poorly developed Informatization of education; * educational statistics do not meet international standards and are not available to recipients; * low coverage of pre-school education and training;

<ul style="list-style-type: none"> * high results in the international study TIMSS-2007; * entry into the European educational space. 	<ul style="list-style-type: none"> * lack of integration of the content of general secondary and higher education; * unsatisfactory material and technical base of educational institutions; * poor quality of educational services; * insufficient development of inclusive education; * lack of a national qualification system; * lack of balance between the supply of the education system and the demand of employers for the qualification of graduates of colleges and universities; * lack of integration of higher education and science.
<p>Opportunities</p>	<p>Threats</p>
<p>For the state:</p> <ul style="list-style-type: none"> * improving the competitiveness of Kazakhstan's education; * improving the quality of human capital; * ensuring social and legal guarantees of the quality of life of children; * increased efficiency in the use of human resources; * stabilization of the national economy; * investment support for education from international organizations and employers; * the emergence of new effective management practices in education; * popularization of sports among students; * improving the efficiency of budget use; * increasing accessibility, attractiveness, quality, openness of education; * ensuring sustainable growth of the country's economy; * improvement of international ratings; * increasing the responsibility of parents for the upbringing of the child; * access to pre-school education and training; * attractiveness of the teaching profession; * training throughout the activity, including abroad, and development of professional competence. <p>For parents:</p> <ul style="list-style-type: none"> * choice of educational institutions; * participate in the management of education; * ensuring free access to pre-school education and training; * implementation of parent - organization of education - child communication through remote information notification about the success of the child. <p>For teachers:</p> <ul style="list-style-type: none"> * attractiveness of the teaching profession; * provision of career development system; * training throughout the activity, including abroad, and development of professional competence. <p>For students:</p> <ul style="list-style-type: none"> * access to quality education for all; * access to the best educational resources and technologies; * development of communicative and professional competence. 	<ul style="list-style-type: none"> * failure to achieve the set goals and objectives due to insufficient funding for education; * low motivation of the teacher, the lack of prestige of the teacher's profession; * low level of preparedness of a significant part of teachers; * lack of commitment to self-education and professional growth of teaching staff; * low motivation of users to use e-learning system; * increase priority for obtaining places in pre-schools and shortages of accommodation in connection with demographic processes (increasing birthrate) and migration situation; * deterioration of the quality of education; * failure of terms of commissioning of educational facilities; * increase in the number of emergency schools; * increase in children with disabilities and children with disabilities; * lack of forecast in specialists in the labor market; * the outflow of personnel from the technical and vocational education system due to the discrepancy between the level of wages in the industry and the average wage in the country; * reduction of the number of foreign citizens wishing to study in universities of Kazakhstan; * the outflow of scientists to other States due to more favorable prospects for the realization of their scientific potential; * weak inflow of young people in science; * lack of coordination of subcontractors during the implementation of the program; * low motivation and lack of prestige of the teaching profession; * increase priority for obtaining places in pre-school organizations and the deficit of places in relation to the demographic processes (increasing birthrate) and migration situation.

Note: compiled by the authors.

4. Conclusions

The result of the study, from the point of view of ensuring the achievement of the objectives of the concept of education, allowed to clarify the definition of the applied orientation of the school course of mathematics and to identify a set of didactic principles for the implementation of this orientation (methodological, substantive, methodical continuity, differentiation and individualization) in the senior level of profile training of students.

Research of the constructed model of realization of the applied orientation of a school course of mathematics in profile training in the conditions of implementation of the personality - oriented approach defined the importance and functions of practice - oriented tasks. The necessary components of the didactic system of practice-oriented tasks at the senior level of specialized training are algorithmic problems, optimization problems, "forecast problems" and "review problems".

The use of technologies for managing the process of teaching students to solve practice - oriented problems, created on the basis of the activity approach, allows to develop the ability to solve problems and effectively form an important skill for profile training, which consists in the independent formulation of applied and practical tasks by students at various levels (operational, technological and generalized).

The conducted pedagogical research has shown the effectiveness of the developed technology of teaching students to solve practice-oriented problems aimed at the formation of students' skills to solve and formulate practice - oriented tasks in the learning system.

Further research may be to increase the level of formed skills of students of mathematics profiles to solve practice-oriented problems of the school course of mathematics and the development of subjects and content of courses to solve practice-oriented problems for students enrolled in natural science profiles, as well as elective courses with mathematical content for students of all profiles.

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-
1. Master of Science. Zhetysu State University named after I. Zhansugurov. Taldykorgan. Republic of Kazakhstan
 2. Master of science. Zhetysu State University named after I. Zhansugurov. Taldykorgan. Republic of Kazakhstan
 3. Faculty of Physics and Mathematics. Zhetysu State University named after I. Zhansugurov. Taldykorgan. Republic of Kazakhstan
 4. Zhetysu State University named after I. Zhansugurov. Taldykorgan. Republic of Kazakhstan
 5. Candidate of pedagogics.. Zhetysu State University named after I. Zhansugurov. Taldykorgan. Republic of Kazakhstan

Email contact: king_bara@mail.ru

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[\[Index\]](#)

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