

MATHEMATICS TEACHING IN CONDITIONS OF MULTILINGUAL EDUCATION

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Annotation

In this article factors of the educational process are considered during teaching mathematics of multilingual students. Problem of multilingual teaching mathematics is isolated during the formation of knowledge in mathematics of students. The cause of separation of mathematics as a subject for the problem of multilingual education and rethinking the theoretical possibilities of improving the system of multilingual mathematics education are considered.

The article considers the problem of how to design and experimentally verify mathematics model of multilingual teaching, representing a uniform complex of substantial and technological components in educational process of university.

Keywords: mathematics, multilingual education, educational process.

The modern stage in life of Kazakhstan when the whole world at the turn of centuries and the millennium approached to an absolutely new era of development — the information era, puts in the forefront and such a problem, as the increase of a role of mathematical education. In this regard raises the problem of liability in the theoretical reconsideration of opportunities of improvement system of multilingual mathematical education. Now training in mathematics at schools is carried out in Russian or Kazakh, and then there is a transition to multilingual training in higher education institution therefore a number of problems is connected with features of students training in the conditions of a multilingualism. In the course of training in mathematics the student acquires experience of the last generations containing in concepts, and

is accustomed to use it as means of further knowledge of reality.

Really, from the origin of science the mathematics is the bases of all scientific disciplines, and in complex with mechanics they are basis of all sciences being the main tool in knowledge of surrounding reality. It especially became noticeable against achievements in other fields of knowledge in the last decade.

People count various physical and chemical processes by means of mathematical methods, show the general regularities of behavior of economic systems. Besides mathematical methods are successly applied in geology by search of minerals, in meteorology by drawing up forecasts, in cartography, in sociology to systematization of these or those results. Certainly, the mathematical apparatus is applied in the course of design of difficult

information systems. So that it is necessary to have quality mathematical education to become the highly qualified specialist in any area. Now it is important to approach in a new way to a problem of an educational multilingualism taking into account the experience of researches saved up around the world. Deficiency of the knowledge approved by historical experience of pedagogical systems of the separate people which can be used in development of strategy of new domestic education is more than ever felt. For a clear idea of current situation, for adoption of the correct decisions and forecasting of their future consequences, it is necessary to approach to a problem of multilingual education in a complex, namely from the historical, pedagogical, all-sociological, psychological and psycholinguistic points of view.

At this stage of development of multilingual education it is necessary to resolve the following main contradictions:

- between necessity and requirement of use of a multilingualism for mathematical education and not readiness of theoretical bases of formation of mathematical knowledge of pupils in the conditions of multilingual education;
- between historical and cultural and pedagogical needs for judgment of historical experience of training in mathematics in the conditions of an educational multilingualism and insufficient illumination of this problem in scientific researches, and also a lack of educational and pedagogical literature on this problem;
- between need of further development of system of multilingual education

and established traditional orientation on monolingual training in educational process;

- between preservation of traditional practice of the training of specialists focused on education of the monolingual single-crop student, and need of modern Kazakhstan school for the experts ready to work in the conditions of a multilingualism.

However it should be noted that systematic studying of process of subject-oriented multilingual training is just started. Methodological, theoretical and technological bases of training in natural and mathematical disciplines aren't developed.

Besides, it is necessary to state a certain fragmentariness and absence of the system scientific analysis and synthesis of rich domestic experience of multilingual training by means of Kazakh, Russian and foreign languages (at schools with teaching of separate subjects in foreign languages, in higher education institutions, at advanced training courses). Use of similar pedagogical experience is the important precondition of the scientific and practical solution of problems of modernization of the Kazakhstan education at the present stage.

The analysis of practice and own experience of multilingual teaching of mathematics in higher education institution suggest that the main difficulty of its realization is connected with a problem of preparation of pedagogical shots. The teacher of multilingual training must not know only a foreign language, but also be the expert in a certain field of knowledge, for example, mathematics. The mathematics always was the integral and essential component of human

culture, it is a key to world around knowledge, base of scientific and technical progress and important component intellectual and moral development of the personality. The mathematical apparatus and the corresponding linguistic stereotypes get into all exact sciences, all-technical and some general scientific and special disciplines. Besides, mathematical terminology and symbolics are international. The teacher knowing a "mathematical" foreign language is trained for communication on it in the professional sphere.

For implementation of the program of multilingual training in technical college from our point of view it is necessary to cope with the following tasks:

- 1) define historical and theoretical preconditions, stages and tendencies of development of domestic education;
- 2) develop and prove the complete concept of multilingual training in mathematical disciplines at the higher school;
- 3) construct subject-oriented didactic model of multilingual training;
- 4) design, approve and realize didactic model of multilingual training in mathematics of future experts.

It is necessary to consider the factors which are subject to the account at development of didactic-methodological bases of multilingual training in mathematics:

- specifics of mathematical language;
- communicative qualities of mathematical speech;
- features of the English mathematical language;
- psychological features of thinking in the course of assimilation of mathematics and a foreign language;

- polycultural factors.

The present period is characterized by interest of the learning of foreign language, the caused entry of Kazakhstan into Bologna Process, activization of the international activity of higher educational institutions, increase of the academic mobility of students and teachers, possibility of participation of the Kazakhstan citizens in the international educational projects, etc. In modern programs an ultimate goal of training and mastering by language as a means of communication is communicative competence of the student. The analysis carried out above testifies to forward development and education system improvement in the field of a foreign language, conditions for realization of multilingual training thereby are created.

Mathematics allocation as a subject for multilingual training is connected with a variety of reasons:

- the matematization of modern science, equipment and the technology, being shown that the knowledge becomes exact when for its description is possible to use mathematical model. The mathematics is the integral and essential component of human culture, it – is a key to world around knowledge, base of scientific and technical process and important a component of development of the personality;
- the mathematical apparatus and the corresponding linguistic stereotypes get into all exact sciences, into all-technical and some general scientific and special disciplines. The mathematics is base of scientific researches in many areas of knowledge. The physics relies on

mathematics; for chemistry basic sciences are the mathematics and physics, for biology – mathematics, physics, chemistry, etc.;

- specifics of mathematical language which is shown in symbolics use, allows to avoid indistinct formulations and inaccuracies of reading; the texts written in language of formulas in a sense are international, one more undoubted advantage connected with use of symbolics, the brevity of records is; in mathematical language variables thanks to which it is adapted for expression of the general regularities are applied;

- any mathematical theory can be stated by means of a limited set of standard language turns, their number depends on character of a stated mathematical material;

- the school mathematics is the settled subject, therefore total of terms in the field school knowledge stably.

The main idea of the concept of multilingual training in mathematics consists that the foreign language along with the native language can be used as means of educational and informative activity on mastering by mathematical knowledge in the course of vocational training of experts of any profile. At multilingual training in mathematics the problem of dissociation of thinking and speech in a foreign language as there is not language object of knowledge - mathematical concepts and mathematical methods is removed, informative activity is carried out in unity with speech activity, and assimilation of the subject contents happens at the same time to mastering by means of its expression in native and foreign languages.

The basic idea of the concept – "multilingual training in mathematics" – is defined by us as the interconnected activity of the teacher and the student, directed on mathematics studying by means of native and foreign languages as a result of which synthesis of certain competences of the student providing deep assimilation of the subject mathematical contents, development of mathematical speech, formation of culture of mathematical thinking, and also high level of proficiency in a foreign language for the special purposes is reached [2].

In the course of educational process the factors which are subject to the account at multilingual training in mathematics were revealed:

- communicative qualities of mathematical speech: accuracy, correctness, logicity and relevance of mathematical speech are considered as its basic communicative qualities, that is as some minimum set on which it is possible to judge level of formation of culture of mathematical speech of students as a whole;

- features of the English mathematical language in comparison with Russian and Kazakh: one of the main distinctions between Russian, Kazakh and English – existence of cases in the first and their absence in the second, big convertibility of words of Russian (suffixes, the terminations, prefixes) on number, a sort, a case, etc. These two circumstances give to the Russian and Kazakh languages big flexibility, big freedom in management, allow to diversify a word order and subordinate clauses. On the contrary, in English a word order and parts of the phrase much more rigid. In the word-by-word translation of the mathematical text

into English with full compliance with rules of grammar extremely heavy, in effect, unreadable mathematical text turns out, moreover, often there are serious semantic mistakes. Therefore at a statement of a mathematical material in English we use not the translation of the Russian text, and the retelling based on use of standard turns – mathematical stamps, preparations for creation of the same mathematical statements, for example: "THE <term> of IS <characteristic>" generates such turns, as "The function f is continuous", "The triangle ABC is obtuse"; FOR ANY (symbol or term) THERE EXISTS (term): For any continuous map $f: M$

M there exists a fixed point $c \in M$;
 - the psychological factors which are expressing in interconditionality of formation of speech and mathematical dynamic stereotypes. After all the sequence of intellectual operations is already developed and brought to automatism (for example when mathematical problems are solved at the level of skill, it testifies to existence of a certain set of dynamic stereotypes).

Multilingual educational working programs (syllabuses) are elements of the main educational program. The developed training program at the rate "Mathematics" has modular structure and in the practical part contains subject and thematic modules, each of which is broken into thematic sections.

At the department of mathematics tutorials and educational-methodical complexes in mathematics were created. At selection and the material organization in a subject the attention not only to subject and substantial aspect, but also to the

language was paid. Texts were estimated from the point of view of their lexical and syntactic complexity, much attention was paid to their didactic processing as which we understand system of the tasks operating informative activity of students and connecting together the contents with technology of training. For formation language means of verbalization of thought processes (description, explanation, analysis, synthesis, generalization) training in mathematics was preceded by studying of the main mathematical language stamps in a foreign language.

For the fullest realization of tasks and the principles of multilingual training in mathematics the wide palette of methods, receptions and tutorials was used, their choice and a combination depended on a concrete educational situation. At the initial stage of acquaintance to a subject it was a lecture of a teacher, conversation, a reproductive and reciprocal method. Lectures were visually accompanied by the presentations created by means of the Power Point program. Use of visual means of language support at multilingual training in mathematics possesses the big importance as serves as a support for creation of own statements and verbalization of cogitative activity of students in a foreign language that is the following stage at development of the subject mathematical contents after development of language means.

Formation of subject knowledge in the course of multilingual training in mathematics was carried out by an inductive way and by means of heuristic methods: from understanding

to concept, through exercises to assimilation of a conceptual framework, detection of regularities and the formulation of rules, theorems and development of algorithms. Studying of a subject matter in a multilingual mode represents difficult process as the contents has to be acquired via so-called "filter" of a foreign language that assumes concentration being trained at the same time both on the contents, and on a form. In the course of training experiment it was established that thinking and speech association in the course of multilingual training in mathematics in the best way is promoted by reception of the solution of mental tasks, as thus:

- 1) cogitative activity is directed not on language subject;
- 2) speech is fulfilled on intellectual actions;
- 3) automatism of speech action is reached;
- 4) intellectual and speech actions give in to control from the teacher due to their predefiniteness.

Social stability, sustainable economic growth and inter-ethnic unity in the country –is the result of the 24-years sovereign history of Kazakhstan. They will allow to demonstrate education, knowledge, intelligence as the material force, capable to provide further progress of our country.

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