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ЭВОЛЮЦИЯ БИЛИНГВАЛЬНОГО МАТЕМАТИЧЕСКОГО ОБРАЗОВАНИЯ В РОССИИ

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THE EVOLUTION OF BILINGUAL EDUCATION IN MATHEMATICS IN RUSSIA

Introduction

Bilingual education (BE), in which teaching and learning are conducted in two languages, is a growing global trend. Bilingual mathematics education (BME) is of particular interest as it offers unique benefits to students. Mathematics as a core subject is necessary for success in various areas of life. This system has evolved over a long period of time, so our goal is to analyze the stages of the development of BME. Exploring its history one can better understand how the field has evolved, what factors have influenced its current state, and how social, cultural and political contexts have shaped its practice.

The idea of polylingualism, or “polyglotism” (according to J.L. Comenius), has a long history. Multilingualism was popular in the Age of Enlightenment. In the 18th century there were many bilingual educational institutions in the Russian Empire, some of the most famous of them were the Smolny Institute, Simferopol Folk School; Husayni, Izh Bubi and Galiya Madrasahs. Many of their graduates were highly educated moral people who held important positions in their time [1]. After the events of 1917 all of them were closed, and for years there was no or little interest in BME.

Nevertheless, in the 1950s there were certain historical prerequisites, which sparked interest in BE in the USSR. First, there were growing socio-economic, political and cultural needs of the country, dictating the necessity to train highly educated specialists, proficient in foreign languages and capable of independent creative and scientific activities. Second, after the victory in the Great Patriotic War new goals were set in the field of foreign language learning, as it was necessary to restore and restructure the education system despite the evident lack of appropriate didactic and methodological support. Finally, the expansion of the socialist camp to Eastern Europe as well as the spread of Soviet ideology in these countries required a great number of bilingual specialists to provide humanitarian aid in the development of education, health care, construction and industry [2].

Professor L.L. Salehova pointed out the main periods of the development of BE in our country.

1947-1960 marked the initial stage of the development, which took place in the USSR when there appeared the first educational institutions, in which some disciplines (but not general education subjects) were taught in foreign languages (mainly, French, German and English).

1961-1976 was the stage of the progressive development of the theory and practice of BE at all levels (school, (university, postgraduate). The number of educational institutions where certain disciplines were taught in a foreign language increased. The training of Soviet and foreign specialists in Russian as a FL and in other foreign languages for work abroad began.

1977-1987 was the stage of stagnation. The traditional bilingual school education in a foreign language gave way to the in-depth study of a foreign language.

1988-2007 was the stage of renewed interest and further development of BE and BME, in particular. Various models of bilingual education were implemented as the home system of foreign language education was rapidly developing. BE and BME became important instruments and pedagogical means of the internationalization of Russian education [1].

In the 1990s Russia began to develop bilingual mathematics education. As an important and integral part of human culture mathematics penetrates into all sciences, both natural sciences and some humanities. Eminent scholars have noted similarities in the processes of learning languages and mathematics because the latter is also a language system. In bilingual teaching of the subject the problem of inconsistency of thinking and speech in native and foreign languages is eliminated, as the mastering of the subject occurs simultaneously with the mastering of ways of its expression in two languages [1].

Professor L.L. Salehova highlighted several reasons for the development of BME in our country.

- First, modern science, engineering and technology are impossible without mathematics, which is proved by the fact that knowledge is made accurate when it is possible to use a mathematical model to describe it.
- Second, mathematical apparatus and corresponding linguistic stereotypes are penetrating many sciences. Modern physics is based on mathematics, which together form the scientific foundations of modern chemistry. The three of them are the basis of modern biology and so on.
- Third, mathematical language is specific, which is manifested in the use of symbolism. It helps avoid vague formulations and inaccurate readings, so texts written in the language of formulas are in a sense international, that is why, the language of mathematics is adapted to express general regularities.
- Fourth, any mathematical theory can be presented with the help of a limited set of standard language expressions, their number depends on the nature of the mathematical material being presented: if calculations and formula transformations are mainly carried out, very few constructions are needed (which is not always the case with algebra and geometry).

- Finally, the differentiation in mathematical training of students (basic level, profile level) poses new requirements to the quality of training of math teachers [1].

In the first stage BME presupposed the use of two languages (native and Russian) in teaching and the qualitative mastering of the subject content by students in both languages. As a result of the smooth transition from one language of instruction (mother tongue) to another (Russian), students were able to avoid serious educational problems in the process of learning mathematics. Later the concept of BME for future teachers was developed. It was based on general philosophical methodological principles that provide a holistic approach, study the phenomenon in its development, connections and interaction with other phenomena, and consider the development process as self-movement and self-development, conditioned by inherent internal contradictions.

The key condition for successful teaching in the field of subject-oriented bilingual education was a high level of communicative competence of the teacher both in the subject and in the foreign language. This, in turn, posed certain requirements for teacher training [1]. Therefore, to implement this concept, pedagogical universities began to train teachers in two profiles “Mathematics” and “Foreign language”. Bilingual university courses of study were set up; the linguistic and didactic basis of BME was formed; educational materials are created [3].

The idea behind BME was that a foreign language along with the native language could be used as a means of educational and cognitive activity to master mathematics in the process of professional training of future math teachers. In BME the problem of the division of thinking and speech in a foreign language is removed, as there are non-linguistic objects of cognition - mathematical concepts and methods, hence, cognitive activity is carried out in unity with speech, and the mastering of the subject content occurs simultaneously with the mastering of the means of its expression in native and foreign languages [1].

2007-2022 saw the revival of BME both in home and foreign education systems. In our country the rapidly growing interest in BE and BME was connected with Russia's entry into the Bologna process, international activities of higher education institutions, increased academic mobility of students and teachers as well as their active participation in international educational projects.

Professor L.L. Salehova noted that during that time BME in pedagogical universities implemented the holistic approach, which was based the concept of “dialogue of cultures” and the competence-based approach to the assessment of educational outcomes. Two different models of BME were piloted: ***the dual learning model*** (i.e. an educational approach integrating subject content with language learning and allowing students to develop both language skills and subject knowledge simultaneously) and ***the split language model*** (i.e. an approach when instruction in different subjects is provided in different languages) [1].

Within the framework of this concept the main principles that determined the specificity of BME were highlighted. They predetermined the choice of content, methods and forms of teaching in accordance with didactic standards. The peculiarities of the structure and content of bilingual mathematical competence of future

teachers as a key goal of BME were identified and substantiated. The criteria for assessing the level of bilingual subject competence (subject, linguistic, pedagogical, intercultural) were developed.

Based on the proposed concept, the didactic model of BME, which combined goals, content and teaching methods, was designed, experimentally tested and implemented in the educational process. The formation of bilingual subject competence (BSC) in mathematics was the strategic goal of the projected model. According to Professor L.L. Salehova, it was to be put into practice by meeting the following objectives: 1) the formation and improvement of students` linguistic, mathematical and intercultural competences, and 2) the mastering of mathematics in two languages [4].

To achieve the maximum effectiveness in bilingual mathematics teaching, a variety of methods, techniques and teaching materials were used, their choice and combination depended on the specific learning situation. Increasing motivation to learn mathematics and foreign language. Taking the current situation into consideration, special attention was paid to maintaining motivation in pursuing BME.

Conclusion

The history of BME demonstrates its evolution from the first programs developed in the 1960s to contemporary approaches that integrate technology and inclusive teaching methods. This process reflects not only changes in educational practices, but also a growing recognition of the value of bilingualism as a tool for maintaining cultural identity and social integration.

BME has become an important vehicle for developing language and math skills, fostering deeper understanding of subjects and improving students' academic performance. Modern programs based on research and innovative methods continue to adapt to the needs of a multilingual society, ensuring access to quality education for all students, regardless of their linguistic background.

Thus, mathematics bilingual education not only contributes to academic success, but also plays a key role in fostering a tolerant and inclusive society that values diversity and multiculturalism. The future of this field promises further research, innovation, and program expansion to meet the challenges of modern education even more effectively.

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