

# Online Platform of Mathematical Terms in Karakalpak Language

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**Abstract**— The paper is devoted to the creation of an online platform of mathematical terms in Karakalpak language and its importance for education, cultural heritage and development of scientific research in Karakalpakstan. The platform provides access to a rich base of mathematical terminology in the native language, which facilitates the learning and teaching of mathematics for Karakalpak students and teachers. It contributes to the preservation of cultural values, enriches linguistic resources and stimulates scientific cooperation in the field of mathematics. The creation of this platform emphasizes the importance of linguistic diversity and cultural identity in the context of scientific and educational progress.

**Keywords**— Online platform; mathematical terms; terminology; dictionary; karakalpak language; PHP; API.

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## I. INTRODUCTION

In the modern world, mathematics serves not only as a tool for understanding nature and phenomena, but also as a universal language that connects different cultures and societies. However, despite this universality, the importance of creating and improving mathematical terminology in the context of each nation cannot be underestimated. Each nation has its own cultural, linguistic, and historical specificities, and mathematical terminology must be able to reflect and accommodate these characteristics. Creating a unique mathematical terminology for each people contributes to education, research, and societal development. This also emphasizes the importance of preserving cultural identity and linguistic richness in the context of mathematics, which can be used to solve various problems, both every day and scientific. Many nations with a small percentage of the population strive to preserve their language culture, and many of them create mathematical dictionaries of mathematical terms.

The dictionary created in Czech language by M. Novák and P. Langerová, which covered 2500 mathematical terms [1], can also be included in this list. Besides the cultural component, such dictionaries undoubtedly play a significant role in the process of formation of elementary knowledge. For

example, the role of mathematical terms in improving the quality of education was discussed in [2], [3], [4].

The process of globalization and the rapid development of digital and internet technologies has affected every aspect of humankind. Today humankind effectively uses various services offered by such technologies, one of which is electronic platforms. Naturally, the question arises about the application of electronic platforms in the process of improving scientific terminologies and the appropriateness of using such platforms. E-platforms play an important role in solving various problems in the modern world by providing effective tools and resources for solving a variety of tasks. Here are some key areas where e-platforms have a significant impact: education, health, business and commerce, communications and social media, scientific research, environment and sustainability, public administration, finance and banking.

The creation of an electronic platform of mathematical terms is a powerful tool to promote knowledge dissemination, education and research, and to support cultural diversity and inclusion. This initiative has the potential to significantly improve access to mathematical terminology and contribute to the advancement of science and education.

In this paper, we will consider the issues of improving the base of mathematical terminologies in Karakalpak language

and creating an electronic platform of such terminologies, allowing to define the meaning of the term in several languages.

## II. MATERIAL AND METHOD

### A. Explanatory Dictionary of Mathematical Terms in the Karakalpak Language

Mathematics is a universal language that transcends the boundaries of national cultures and languages. Mathematical terminology serves as a bridge between the scientific and cultural traditions of small nations and the global community. This language enables the exchange of knowledge, the conduct of scientific research, and the development of innovations. The improvement of mathematical terminology is an important and relevant issue in the world of science and education. Here are several key aspects emphasizing the necessity of this process:

*Clarity and comprehensibility:* Mathematics is a universal language, and clear and unambiguous terminology plays a crucial role in preventing misunderstandings and errors. Enhancing mathematical terminology contributes to understanding mathematical concepts and reduces possible errors in their interpretation.

*Inclusivity and cultural diversity:* Different cultures and languages may have their unique terms and concepts in mathematics. Improving terminology allows for the acknowledgment of this diversity and makes mathematics accessible to everyone, regardless of language and cultural peculiarities.

*Educational process:* For students and learners, clear and refined terminology simplifies the learning process and helps them more effectively grasp mathematical concepts. This is especially important in the context of education.

*Scientific research:* Researchers need clear and unambiguous terminology to work on new mathematical theories and models. Improving terminology contributes to the development of scientific knowledge and innovations.

*Intercultural communication:* In a world where international collaboration and knowledge exchange are becoming increasingly important, clear and standardized mathematical terminology facilitates communication among mathematicians and researchers from different countries and cultures.

*Reducing Confusion and Errors:* Often different linguistic versions of mathematical terms can lead to confusion and errors in the science, education, and practical application of mathematics. Improving terminology helps to reduce the likelihood of such misunderstandings.

In general, the improvement of mathematical terminology contributes to the clarity, accessibility and accuracy of mathematical concepts, which is crucial for the advancement of science, education and global society as a whole. This effort helps to make mathematics more accessible and understandable, taking into account cultural and linguistic differences, and contributes to the development of knowledge and intellectual resources.

It is known that for successful mastering of a particular subject the role of special literature written in the necessary language is great. It is worth noting that higher educational institutions of the republic publish modern textbooks in the

necessary areas. It should be noted that mathematical terminology in Karakalpak language is quite well developed [5]. But the intensive development of mathematics has given rise to a number of new terminologies that are difficult to translate or have no translation due to their uncommonness. In addition, the world scientific community uses a common set of mathematical terms in English, and some of them have become commonplace. As a consequence, it is not uncommon for different users to use Uzbek, Russian and English variants of a term. Moreover, the lack of explanatory dictionaries developed on the basis of mathematical terminology formed in Karakalpak language makes learning and teaching mathematics in the native language a very difficult task. In this regard, it was decided to improve the base of mathematical terminology by creating an electronic platform of explanatory dictionary of mathematical terms in Karakalpak language. It is worth noting that today there are various online platforms of mathematical dictionaries and glossaries. Among them, we can highlight the online resource ITS Education Asia [6], The Definitive Glossary of Higher Mathematical Jargon [7], Interactive Mathematics Glossary [8]. Given the relevance of this task, for the development of online platform attracted a group formed from experienced professors-teachers of Karakalpak State University named after Berdakh and researchers of the Karakalpak branch of the Institute of Mathematics named after V.I.Romanovsky Academy of Sciences of the Republic of Uzbekistan.

The online platform to be developed will consist of two parts, working on the server and client parts. The server part will be developed using PHP programming language and My SQL database management system; the client part will be developed using HTML, CSS, Java Script programming languages. The developed platform will be placed on the server of Karakalpak State University. The administrator of the platform will make changes and additions to this online platform as much as possible. In addition, users of the system will be able to create their own pages on the online platform.

## III. RESULT AND DISCUSSION

### A. Architecture and working principle of the online platform of mathematical terms

Today, API-based architecture is widely used to build web applications. The reason is that users can use several types of devices that run on different platforms and are written based on different programming languages. To ensure that all of them can easily interact with the web application, the best solution is an API-based architecture. The impact of different devices in this architecture is shown in the following figure (Fig. 1).

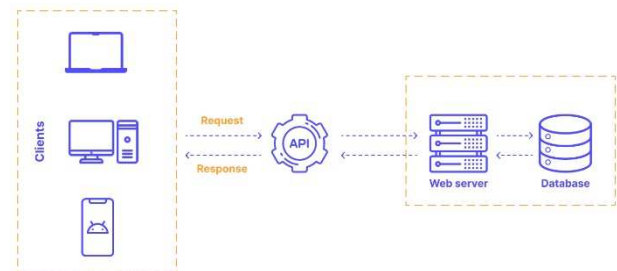


Fig. 1 Basic elements of an application built using an API-based architecture and how they interact

Using this architecture allows us to use different programming languages and different technologies without being tied to a specific platform, device, or programming language. This architecture also allows us to keep the API of the application open and integrate it with various applications of other developers. Considering the requirements for the system and the capabilities of the architecture developed above, it was decided to use this architecture in the creation of this system.

The architecture chosen for the information system provides several programming languages and frameworks for programming on the server side, i.e. in the server part of the application, each of which has its own advantages and disadvantages. Based on the requirements for the application to be created, it was decided to use the Laravel framework written in PHP. This framework is currently one of the most popular frameworks for server-side programming and has an elaborate security system. Because of these features that the framework provides, it was chosen as the main tool for creating the system.

In the system, rights are granted to users on the basis of roles. There are 4 different roles of users in this system:

1. Super Administrator
2. Administrator
3. User
4. Commentator

Users who have registered in the system by themselves are given the user role and corresponding rights. The super administrator creates other types of users.

When creating the design of the information system, the main goal was to make it as simple and convenient as possible to take into account the experience of users who use online dictionary and similar systems. As a result, its home page looked as follows (Fig. 2).

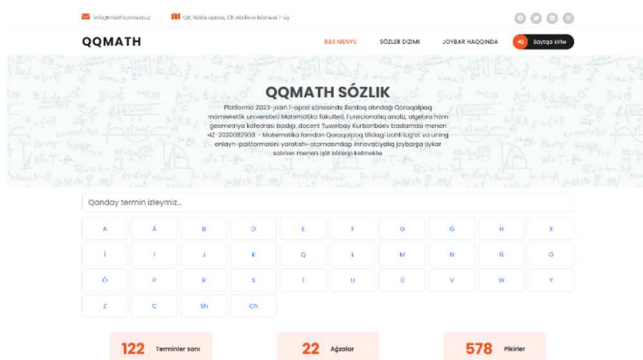


Fig. 2 Home page of the system

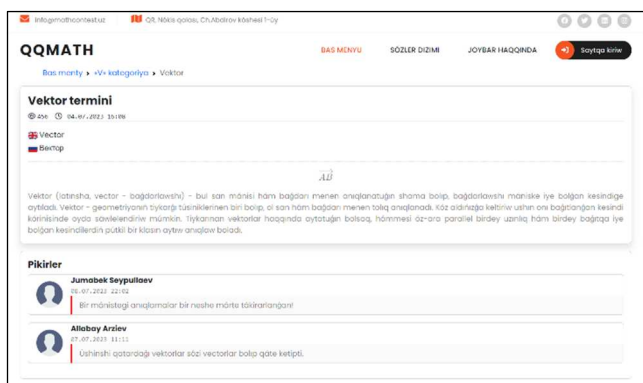


Fig. 3 Page for detailed information about the term

At the top of the page there is a menu for navigation, followed by general information about the system, a field to search for the desired term and buttons with category names to browse terms by category.

The subsequent page in the system provides detailed information about the term, utilizing the Katex library [9] to render mathematical formulas.

The Katex library differs from others in its rendering speed. For convenient display of formulas and data, the interface elements are minimized here (Fig. 3).

On this page, an opportunity to leave comments has been created to discuss controversial situations arising regarding formulas and to collect opinions. It was decided not to grant this right to all users, in order to collect opinions and comments only from experienced members of the industry (e.g., math teachers, etc.). The right to leave comments is specifically granted by the administrator.

Currently, terms are displayed on the main page of the system in the order of the number of views, i.e. the most viewed terms are presented to the user first. Taking into account that this is not the right solution to provide relevant information to the user, at the next stage of our research the goal is to introduce a term rating system and evaluate the term rating using a special algorithm.

#### IV. CONCLUSION

The creation of an online platform of mathematical terms in Karakalpak language represents an important step in the development of education and cultural heritage of Karakalpakstan. This platform will not only enrich the mathematical vocabulary in Karakalpak language, but also contribute to the preservation and promotion of cultural and national values. In this paper, we have summarized the key aspects and benefits of creating such a platform:

*Preservation of cultural heritage:* The creation of a platform in Karakalpak language contributes to the preservation and development of the cultural heritage of the ethnos. It strengthens and promotes Karakalpak culture in the context of mathematics and education.

*Education and Accessibility:* The platform will provide access to mathematical terminology in Karakalpak language, which will facilitate teaching and learning of mathematics for students and teachers whose mother tongue is Karakalpak.

*Facilitating scientific research:* The platform will be a valuable resource for Karakalpak mathematicians and researchers, allowing them to conduct research and publish in their native language.

*Unification and intercultural interaction:* The platform promotes the unification of mathematical terminology in the Karakalpak language, providing a clearer understanding between Karakalpak mathematicians and their colleagues in other countries.

*Cultural and linguistic exchange:* The creation of a Karakalpak language platform stimulates cultural and linguistic exchange between Karakalpakstan and other nations, promoting cultural diversity and respect.

The creation of an online platform of math terms in Karakalpak language not only promotes education and scientific progress, but also strengthens cultural and national identity. This project emphasizes the importance of

preserving and developing linguistic heritage and enriching world mathematics with new linguistic resources.

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