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## Cognitive-Communicative Technology of Training Foreign Students of Medical Universities

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### Abstract

The article presents the technology of training in the clinical departments of the medical universities. At these universities innovative technologies for teaching students in multilingual groups and foreign students are of particular relevance. According to the developed cognitive-communicative technology of bilingual education, the goal of our article was to provide scientific and methodological support for the process of bilingual (Kazakh-English and Russian-English) training as a part of the Phthisiology course. The allocation of the structure of the studied text in the form of diagrams and tables allows you to clearly see the "skeleton" of the material on a functional-semantic basis. The cognitive structure of the studied theoretical material, representing a "skeleton" of interconnected parts, ensures the integrity and systematic nature of the perceived content, which is important for preservation in long-term memory. The research methods of this problem were the analysis of educational and program documentation, authentic materials in English; semantic structuring of tuberculosis training material; questioning, pedagogical observation, interview, testing, ascertaining and forming pedagogical experiments. A survey of students showed the effectiveness of this teaching methodology. The academic performance of 4th year students studying according in the approved methodology was 89.1%, while academic performance of students studying according to the standard methodology group (a lecture, practical lesson, and a seminar) was 75%. The developed mechanism for the design of multilingual education in the discipline "Phthisiology" serves as a tool for the development of educational and methodological complex in other medical courses, which implement cognitive-communicative technology in teaching non-linguistic disciplines of universities.

*Keywords:* cognitive-communicative technology, bilingual education, integration of diverse subject methods, understanding, memorization

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## **Introduction**

Kazakhstan is a dynamically developing state that is always positive about international cooperation in various fields of science and culture (Haque & Haque, 2005). The language of international communication with students from different countries often is English. In this regard, the problem of mastering a foreign language as a language of instruction both by teachers (who were at universities in Soviet times) and students who need to be ready for active professional cooperation at the international level becomes urgent.

The training of foreign English-speaking students in Kazakhstan, as well as the preparation of local students for foreign-language professional communication in order to freely integrate into the international professional society, places teachers to strengthen the English-language learning process. This, in turn, involves the use of new technologies that will be effective at the current stage of development of Kazakhstani higher education.

## **Purpose and objectives of the study**

According to the developed cognitive-communicative technology of bilingual education, the aim of our study was to provide scientific and methodological support for the process of bilingual (Kazakh-English and Russian-English) training as part of the Phthisiology course intended for foreign students.

## **Literature review**

The choice of teaching technologies depends on specific tasks in the education system, learning conditions, in particular, on the level of language proficiency by the subjects of the educational process at the university.

In our case, the question is the integration of diverse subject methods - non-linguistic discipline methods and language methods, in order to form and improve professional communication skills and use a second language as an active means of communication. Therefore, first of all, it is important for a specialist in non-linguistic discipline to determine the place, role, purpose and, as a result, the volume of foreign-language educational material. At the same time, the teacher is required to correctly operate with linguistic means.

Experience in different student groups reveals the problems that exist today in connection with attempts to parallel learning a foreign language. Most often, the inclusion of a foreign language means working with foreign texts and retelling these texts. This is the deepest mistake, because until the “alien” text turns into “their own”, students will have to expect from them only artificial retelling, which will be forgotten after a while. Consequently, the anthropocentric principle should become the leading one, when we must rely on the results of cognitive text processing, the definition of speech tasks within the framework of the topic under study, methodological techniques for artificially creating situations in real professional life in which teachers communicate in a foreign language. In our study, the task of detailed understanding by students of the subject material itself is set. This is the first condition for the formation of foreign language communicative competence as a result of the implementation of cognitive-communicative technology for teaching non-linguistic discipline (Passov, 1991). First of all, the teacher must have modern approaches to enhancing the process of professional communication. To solve such urgent tasks of multilingual teaching, we rely on the ideas of cognitive reflection of the objective world of Tolman (1948), theoretical provisions on the interaction of consciousness and language by Kubryakova (2004), Boldyrev (2016), the concepts of understanding, generation and presentation of knowledge by Isenbaeva (2011), cognitive ideas about the categorization of the language system (Ivashkevich, 2012; Besedina, 2012; Sharandin, 2012; Furs, 2012).

The new results of cognitive science and cognitive linguistics are important primarily for future medical specialists who must manage to process a large amount of scientific material, learn a significant number of terms and concepts, and understand the fine lines between different diseases with similar symptoms. It is impossible to master the last professional skill without any algorithms that, based on a step-by-step analysis, can exclude some diseases and confirm others. Moreover, a foreign language should not occupy an autonomous position and intersperse as an additional layer of work. The art of the teacher should just consist in the fact that the integration of teaching methods from the field of teaching a medical course and a foreign language should be carried out as a naturally occurring process. To do this, the teacher must possess effective technologies aimed at solving urgent problems of integration of non-linguistic and linguistic teaching disciplines.

At the present stage, linguodidacts are in the process of searching for a certain central link in language education for students of higher medical schools with multilingual education, on the basis of which the key competencies of a future doctor are formed.

### **Methodology**

For medical students to develop conscious cognitive activity and skills to work creatively, the integration of various forms and methods of training during the educational process is necessary: traditional problem-searching, illustrative methods must be combined with interactive forms of training with the use of innovative teaching technologies. At the present stage, in the clinical departments of higher medical schools, innovative technologies for teaching students in multilingual groups and foreign students are of particular relevance.

To denote the basic concepts of professionalism, there are a number of names, such as: fundamental competencies, basic competencies, key classifications, fundamental forms. Each of these concepts allows one to approach a certain level of training, and communicative competence is in the foreground. Highlighting the cognitive-communicative approach aimed at the formation and development of competence led to the development of innovative teaching technologies. An advantage of this methodology is the formation of communicative competence on the basis of subject competence (the “subject” of communication), when educational communication is specially organized within the framework of the topic under study. Substantive competence is achieved through cognitive structuring of the thematic field as a means of representation in educational settings.

An example of integration of one cluster of sciences (for example, integration between individual disciplines within the biomedical sciences) is the section - clinical medicine, which is based on disciplinary categories: disease, diagnosis, treatment and prevention, which are closely intertwined with ontological categories: causal relationships, process, time, space, sign, quantity, etc. such disciplines as gastroenterology, phthisiology, gynecology and many others others, studying the structure of organs in normal conditions, their pathology, treatment and prevention. Each of the elements of this process has its own special ways of language expression. These methods are represented by morphemes, term elements, tokens and terminological phrases, as well as diagnostic formulations, for the construction of which lexical, morphological and grammatical language units can be used.

To build a cognitive map, it is necessary to perform the following procedures: 1) at the first stage, isolate key concepts from the entire array of material, the means of language objectification of which are special

terms assigned to them, often forming the core of the term system and their immediate terminological environment; 2) at the second stage, you should identify the categorical characteristic inherent in each of the terminological groups, contributing to their ordering into a single categorical heading; 3) at the third stage, it is necessary to identify the level structure of each category; 4) at the fourth stage, it is important to isolate the key concepts and sub-concepts of each category; 5) the fifth stage involves fixing the components of a given subject area / professional activity and displaying the connections between them.

If we consider this sequence of actions from the point of view of cognitive mapping, then the first two stages correspond to semantic mapping, the third and fourth are similar to conceptual, and the last to causal.

Based on the scientific ideas of scientists on cognitive knowledge of the topic and its linguistic organization, the need for foreign language and bilingual (relying on the native language of students for a deep understanding of the program material) training involves using an effective way of learning. The main goal of our study was the use of the cognitive-communicative technology of bilingual education (Kazakh-English and Russian-English) developed by Bulatbaeva et al. (2018) as part of the development of the course of Phthisiology by foreign students. At the same time, we carried out cognitive processing of program material and the integration of teaching methods into the course of phthisiology in English. Preliminary planning was carried out according to the integrated teaching methodology in the learning process, then the implementation of the bilingual educational process in stages in order to develop professional speech and communicative competencies. The technology contributed to the mastery of medical knowledge in accordance with the educational standard and long-term memorization of the content of educational material, which is considered as the primary and prerequisite for the successful implementation of any type of activity.

The following research methods were used: analysis of educational and program documentation, authentic materials in English; semantic structuring of tuberculosis training material; analysis of scientific works on foreign language teaching of non-linguistic disciplines; analysis of domestic and foreign experience in the formation of foreign-language professionally oriented speech; methods of empirical research: questioning, pedagogical observation, interviews, testing, ascertaining and formative pedagogical experiment.

## **Results**

The study involved 3 groups of 4-year foreign students from the Faculty of General Medicine - 31 people, the control group consisted of students from multilingual groups of 45 people. In the main group, which included foreign 4-year students (31 people), special attention was paid to the assimilation of the material

on the basis of comprehension of the group of semantically combined words and phrases that serve one specific semantic fragment. English vocabulary was organized on a hierarchically organized cognitive structure, which ensured the assimilation strength. Such tabular structuring of the educational text on a functional-semantic basis allowed students to learn the "skeleton" of the material well. First of all, the teacher ensured the integrity and systematic perception of the content. Consequently, the new theme was well preserved in long-term memory. The task of the teacher in the future was to provide all the cells of the table with semantic groups of lexical tools in the first language. Then a new thematic vocabulary was activated with the help of leading questions, so that students understood the material and at the same time voiced the perceived material in words of a foreign language in certain "portions".

The control group consisted of students of multilingual groups, 4-year students who were taught in two or three languages (Kazakh and / or Russian and / or English) in the amount of 45 people. Here we used a standard teaching methodology in the form of working with foreign language texts and retelling of these texts in the form of lectures, seminars and practical exercises.

The results of the study of the authors of this work were: testing the cognitive-communicative technology of multilingual education in the process of training Phthisiology for medical students; Methods of linguistic processing of the lexical and grammatical material of a medical text and use in the educational process as teaching units have been worked out. The applied method of cognitive-communicative technology of teaching foreign students or students of multilingual groups contributed to the progress of memorizing terminology, understanding the process of primary infection and the assimilation of educational material as the integrity and consistency of the perceived content. When explaining their homework, they used standard phrases from the above tables, which facilitated visual memorization, as well as parallel repeating phrases automated ablation and long-term memory. Technology is considered a condition for the successful repetition of lexical material in integration with grammar (second stage), lexical and grammatical material in integration with the organization of professional dialogs (third stage), synthesizing the acquired skills in monologic speech organized on the topic (fourth stage).

Testing of the material on the topic "Mycobacterium of tuberculosis (history, origin, distribution pathways, granuloma development, structure and properties)" was successful. The goal of interconnected classes on the topic has been achieved.

The steps in a bilingual learning process on a topic are:

*1. The construction in the consciousness of students of the cognitive structure of educational material (a specific thematic field).*

First of all, we tried to build a cognitive structure of the topic in the students' linguistic consciousness as the basis of professional knowledge on the topic "Mycobacterium tuberculosis", in order to then form lexical and grammatical speaking skills on the material based on the cognitive structure.

To ensure the storage of information being mastered in the form of certain formations in the long-term memory of students, we presented material in the form of interconnected elements of a particular system. In the students' memory, it becomes possible to save the total number of fragments ("semantic pieces"), for each fragment, key lexical tools are remembered.

The cognitive structure of the thematic block served as a unit of learning.

The lexical system of a certain thematic field was a group of semantically combined words and phrases that served one specific microtheme. Remembering the words of the English language was the most durable, since this process was based on a hierarchically organized cognitive structure. Such a structure was the microthemes of the studied material - a textbook item. The student is not always able to independently isolate microblocks. It is difficult for him or her to understand a continuous text; he or she is not able to keep in memory several microtomes replacing each other. If he or she does not understand the internal relationships of semantic blocks, then he or she loses interest in the material being mastered. We took this into account when planning the educational process. Isolation of the structure of the studied text in the form of diagrams, tables made it possible to clearly see the "skeleton" of the material on a functional-semantic basis. So, we present the topic "Tuberculosis" in the following form (see Table 1).

Table 1. Thematic block " Mycobacterium of tuberculosis: pathogens, examination, treatment".

1.1.1. 1 sub-topic	1.1.2. 2 sub-topic	1.1.3. 3 sub-topic	1.1.4. 4 sub-topic
1.1.5. Pathogen of tuberculosis	1.1.6. Methods of examination	1.1.7. Clinical forms	1.1.8. Treatment of tuberculosis
1.1.9. Properties of Mycobacteria of tuberculosis (acid, alcohol, alcid resistant)	1.1.10. X-ray examination (fluoro, MRT, KT, roentgen)	1.1.11. Primary forms of tuberculosis	1.1.12. Drug-sensitive of Mycobacteria of tuberculosis (1-2 cat)
1.1.13. Structure of Mycobacteria of tuberculosis (core, cytoplasm, trace element)	1.1.14. Bacteriological methods (sputum by microscopy, bacteriology, gene-expert)	1.1.15. Secondary forms of tuberculosis	1.1.16. Drug-resistant of Mycobacteria of tuberculosis (4 cat)
1.1.17. Reproduction of Mycobacteria of tuberculosis (divide per 18-24h)	1.1.18. Tuberculin diagnostics, (tuberculin, by PCR)	1.1.19. Extrapulmonary forms of tuberculosis	1.1.20. Symptomatic treatment

2. *The gradual metered development of each "fragment" of the thematic field through serving active lexical units of the first language.*

The cognitive structure of the studied theoretical material, represented a "skeleton" of interconnected parts, ensured the integrity and consistency of the perceived content, which is important for maintaining the studied in long-term memory. At the same time, each semantic cell of this whole was represented by a set of key vocabulary. The teaching methodical plan of the teacher is to provide first semantic groups of lexical tools structured in cells in the first language, and then activate them with the help of leading questions in speech, so that students learn the fragments that are well studied separately.

Students initially used foreign words, phrases, and word combinations grouped in columns in the table. Using these words, they revealed the microthemes of a large thematic block. Together with the teacher and in groups, students discussed each microtheme, answering specific questions. Thus, the simultaneous process of knowing the new and its verbal expression was carried out. This technique made it easier for students to perceive the text, also providing them with psychological comfort, since: a) they have no fear of appearing unaware of the topic, b) the topic is new, and everything is in the same position, c) they are given the right to make an erroneous judgment, since they first encountered this material (Table 2).

Table 2. Thematic block “Tuberculosis: properties, structure, infection development”

<p>1.1.21. Pathogen of tuberculosis</p> <p><b>1.1.22. Key words</b></p>	<p>1.1.23. Properties of Mycobacteria of tuberculosis</p> <p><b>1.1.24. Key words</b></p>	<p>1.1.25. Structure of Mycobacteria of tuberculosis</p> <p><b>1.1.26. Key words</b></p>	<p>1.1.27. Development of infection of Mycobacteria of tuberculosis</p> <p><b>1.1.28. Key words</b></p>
<p>1.1.29. Mycobacteria of tuberculosis:</p> <p>1.1.30. 1) opened by R. Koch in 1882.</p> <p>1.1.31. 2) belong to the Micobacteriaceae family, the order Actinomycetalis, the genus Mycobacterium.</p> <p>1.1.32. 3) is an obligate aerobe,</p> <p>1.1.33. 4)it is widespread in the nature,</p> <p>1.1.34. 5) has over 100 species, most of which are saprophytic microorganisms widespread in the environment.</p> <p>1.1.35. 6) are optional intracellular parasites.</p> <p>1.1.36. 7) Gram positive microbe,</p> <p>1.1.37. 8) M.Tuberculosis- highly pathogenic for humans. M. Bovis an agent of bovine tuberculosis, it is pathogenic also for humans and rabbits.</p>	<p>1.1.38. Mycobacteria of tuberculosis:</p> <p>1.1.39. 1) The cell wall creates a hydrophobic barrier (lipid, wax) makes it difficult for water-soluble compounds to penetrate the cell, and grow slowly</p> <p>1.1.40. 2) Lipids and wax from wall provide resistance of bacteria to</p> <p>1.1.41. a)acids,</p> <p>1.1.42. 6) alcohols and alkalis.</p> <p>1.1.43. 3) have the sizes: in length about 1 - 10 mkm, in width - 0,2 - 0,6 mkm.</p> <p>1.1.44. 4) divide per 18-24h</p>	<p>1.1.45. Mycobacteria of tuberculosis:</p> <ol style="list-style-type: none"> <li>1) microcapsule,</li> <li>2) three-layer envelope,</li> <li>3) cytoplasmic membrane,</li> <li>4) cytoplasm with organelles (vacuum, ribosomes, granules),</li> <li>5) uclear substance.</li> <li>6) minerals,</li> <li>7) there is a cord factor consisting of lipids and high-molar acids (mycolic acid, which determines virulent Mycobacteria of tuberculosis (ability to infect).</li> </ol>	<p>1.1.46. Mycobacteria of tuberculosis:</p> <ol style="list-style-type: none"> <li>1) has Immune response to the agent</li> <li>2) has Factor of tissue destruction and caseous necrosis</li> <li>3) specific antigens (proteins) that cause the macro-organism to develop a delayed-type hypersensitivity reaction and antibody formation.</li> </ol>

According to the table of contents, the following questions and answers to them were proposed:

Questions:

- 1) Кто открыл микобактерию туберкулеза и когда? /Who and when discovered the mycobacteria of tuberculosis?/ Қандай ғалым таяқшаны анықтады, қай жылы?
- 2) К какому семейству и роду относятся микобактерии туберкулёза? /Which family and genus includes mycobacteria tuberculosis? /Қай тұқымдасқа таяқша жатады?
- 3) Из чего состоит Микобактерия туберкулеза? /What is the composition of Mycobacteria tuberculosis?/ Таяқшаның құрамын айтыңыз
- 4) Чем отличается микобактерия туберкулеза от других возбудителей инфекции? /How does the mycobacteria of tuberculosis differ from other agents of infection?/ Қандай айырмашылығы өзге қоздырғыштарына қарағанда туберкулездің қоздырғышында?
- 5) Как происходит внедрение микобактерии в организм человека?/ How is mycobacteria introduced into the human body?/ Қалай микобактериялар адам ағзасына енгізіледі?
- 6) Какая иммунологическая реакция происходит в клетке организма человека?/ What immunological reaction occurs in a human body cell? /Қандай иммунологикалық реакция адам организмінде торда болып жатады?

Ответы:

1. Роберт Кох, немецкий ученый в 1882 году.
2. Микобактерия туберкулеза относится к роду актиномицетов, семейству лучистых грибов.
3. Из цитоплазмы, цитоплазматической мембраны, клеточного ядра и клеточной стенки
4. Медленно растет и размножается – один раз в сутки, устойчива к спирту, щелочи и кислотам.
5. Воздушно-капельно, контактно-бытовым путем, транспланцентарно.
6. Повышенная чувствительность замедленного типа.

Answers:

1. Robert Koch, German scientist in 1882.
2. Mycobacteria tuberculosis belongs to the genus actinomycetes, a family of radiant fungi.
3. From cytoplasm, cytoplasmic membrane, cell nucleus and cell wall
4. Slowly grows and multiplies - once a day, resistant to alcohol, alkali and acids.
5. Air-drop, contact-household, transplanted.
6. Increased sensitivity of delayed type.

In the case of volumetric material, one thematic block was submitted in two stages, when each functional-semantic table was a set of microthemes. The proposed methodological method for the development of new material contributed to the development of active cognitive activity of all students, without exception. With a properly created psychological atmosphere, the teacher more often worked with students of medium and weak levels, automatically supporting and not forgetting strong students. In this case, 100% performance of the group is ensured.

*3. "Submission" of grammatical material to the speaker's communicative requests within the framework of the thematic field.*

The problem in the development of multilingualism in the classroom of non-linguistic subjects is the specialists' ignorance of both a foreign language and the language methodology as a whole. Therefore, the task of scientist methodologists, lecturers in continuing education courses is to provide non-linguistic specialists with the necessary tools that are necessary in the processing of educational texts.

For linguodidactics, an important aspect is that a person operates with certain semantic types of elementary statements. The fundamental principle of selection is the principle of the frequency of use of certain semantic types of elementary statements in the framework of a particular topic.

Reliance on frequency semantic types of elementary statements allow a foreign language specialist to use the types of utterance as units of instruction aimed at enriching the grammatical structure of speech. In the Kazakh linguodidactic science Bulatbaeva (2004) developed a new classification of sentence sentences on a semantic basis. Reliance on this classification allows us, within the framework of the topic, to actively

develop the grammatical basis of students' English speech, since the proposed types of sentences allow us to work with whole synonymous series of syntactic constructions in a foreign language, which will lead students to grammar skills before automation.

Table 3. Grammatical structures on the topic “Tuberculosis: properties, structure, infection development”.

1.1.47. Grammatical structures of Russian	1.1.48. Grammatical structures of English
1.1.49. (Кто) открыл/нашел/ сделал открытие (чего?)	1.1.50. (Who) opened/found/made the discovery (what?)
1.1.51. Туберкулез – это .....	1.1.52. Tuberculosis is.....
1.1.53. (Которые) делятся на следующие виды	1.1.54. (Which) is divided into the following species
1.1.55. (Что) относится к (чему?)	1.1.56. (What) refers to (what?)
1.1.57. (Что) принадлежит к (чему?)	1.1.58. (What) belongs to (what?)
1.1.59. (Что) состоит из (чего?)	1.1.60. (What) consists of (what?)
1.1.61. (Что) развивается/прогрессирует/размножается/ становится многочисленными	1.1.62. (What) develops/progresses/multiplies/becomes numerous

And further on the remaining three topics, the grammatical skills of English speech are developed in the manner described above.

The material studied determines the content of learning situations for dialogue. In our experiment, roles were played in the doctor’s conversation with the patient, where the “subjects” of the conversation were the symptoms of the disease (the learned vocabulary and grammatical constructions were already used by students themselves, most importantly, the students fixed the symptoms of the disease), the doctor’s instructions (along with language tools, safety precautions were fixed in the environment, necessary procedures, dosage of medication), psychological support from the doctor (formulas of advice, encouragement), consultation of doctors (discussion of the patient’s condition TB epidemics).

Thus, students were able to learn the material being studied, and also acquired foreign language communication skills on this topic.

## **Discussions**

The formation of knowledge on a non-linguistic subject is a very complex and multi-stage process of processing external experience. Without constructing a scheme in the minds of students of a certain scheme regarding the “subject of discussion”, it is impossible to achieve a coherent statement about it. The presentation of these cognitive structures on the topic and the determination on this basis of a list of potential speech intentions will make it possible to closely link the training material and educational activities with the strategy for the formation of communicative competence.

At the beginning of the 21st century, the problem of integral knowledge as the cognitive basis of the concept of “interdisciplinarity” began to be actively discussed in cognitive science. The scientific community has come to recognize the need for an interdisciplinary approach in research into the formation of the scientific picture of the world and its reflection in the language. Analyzing attempts to develop technology for interdisciplinarity in Russian and Western cognitive science, Zabotkina (2015) shows types of integration of sciences “within the framework of the cognitive cycle at several levels: 1) at the level of a single field of knowledge — local integration (for example, the cognitive-discursive paradigm in linguistics), 2) at the level of the cluster of sciences (for example, integration between individual disciplines within the framework of the sciences of the humanities profile), 3) at the level of interaction of clusters of sciences (then the network is a synthesis of the humanitarian and natural sciences knowledge”.

When processing educational texts, it is important to focus on metatext as a secondary speech product (Austin, 1986; Dijk, 1988; Crismore et al., 1993; Ryabtseva, 1994; Boldyrev & Babin, 2001).

Nowadays it is necessary that traditional problem-searching and illustrative methods must be combined with interactive forms of training with the use of innovative teaching technologies. This is evidenced by many positive areas in the system of education and medicine, namely: the achievement of functional literacy of specialists, the development of academic mobility of students in order to assimilate advanced technologies in the educational system of leading universities in the world, the widespread popularization of the Kazakh language and Kazakh culture, the preparation of the functioning of the Russian language in a communicative way -language space, the study of English and other foreign languages, the development of a trilingual teaching model (Government of the Republic of Kazakhstan, 2018). The transition from modern theories to practical implementation in production, from developed Kazakh-Russian bilingualism to Kazakh-Russian-English trilingualism, the active use of effective technologies in order to enter the world educational and cultural space are the trends of the Kazakhstani way.

This plan takes into account the problems of the development of multilingualism and the difficulties of implementation.

In medical universities of Kazakhstan, there are currently groups with three languages of instruction: 1) groups with the Kazakh language of instruction; 2) groups with the Russian language of instruction; 3) groups with English teaching. In each group there are certain problems with the second (Russian or Kazakh) or with the third (English) language.

The modern approach to the analysis of professional sublanguage primarily involves taking into account the functional unity of cognitive and linguistic structures (Golovanova, 2011; Isenbaeva, 2011) of the corresponding field of knowledge in order to obtain a visual representation of the structure of scientific material and the organization of information-constructive educational activities. Modeling the linguistic functioning of a medical terminological system using cognitive mapping using a specific example is extremely interesting to study and helps to generate new points of view on the methodology for analyzing its structure. We agree with the opinion of Buterus (2013) about the need to determine the composition of information-independent modules, as well as the mechanics of their interaction and the “architecture” of a single system of models in a particular scientific discipline (scientific field). Scientists noted that “... various types of discourse involve various combinations and manifestations of the cognitive mechanisms of human speech activity... the spectrum of disciplines that is involved in the analysis always allows us to focus on the parameter of the model that has not yet been studied” (Buterus, 2013). In this context, the ideas of Novodranova (2015) about the interdisciplinarity of medicine and its linguistic reflection are also relevant.

There is also subject-language integrated learning within non-linguistic subjects called the Content and Language Integrated Learning (CLIL) method. The term CLIL was coined by David Marsh in 1994 (Coyle et al., 2010). The purpose of such training is the simultaneous study of academic discipline and a foreign language, i.e. language is not an object of study, but is used as a tool for cognition of other subjects, as well as for developing the learner’s ability to rethink the learning process, motivation for learning and the formation of communicative competencies. Depending on the chosen model, a language can act as a language of learning, language for learning, language through learning (language through learning) (Samoilova et al., 2014).

But this methodology will not be sufficiently effective in Kazakhstani universities with the dominant Kazakh and Russian languages of instruction, as students do not always have a sufficient level of English and professionally-oriented foreign language. These problems in the system of Kazakhstani education were described in another work (Fahrudinova et al., 2018).

In the Kazakhstani education system, the cognitive-communicative technology that we implement is considered learning. The peculiarity of cognitive-communicative technology lies in the typology of classes as successive steps leading to communicative competence, and the use of special functional teaching tools at different stages of training (with a gradual increase in a foreign language in the thematic cycle of classes).

A survey of students showed the effectiveness of this teaching methodology. The academic performance of 4th year students of a medical university studying according to the approved methodology was 89.1%, while among students studying according to the standard methodology - a lecture, practical lesson, and a seminar - academic performance was 75%. In the process of cognitive-communicative learning, 93.7% of students increased interest in the subject, 70.3% of respondents became interested in creating semantic phrases as an independent work, 85.9% of them believe that these “skeletons” are more effective than text lectures, and 90.6% used tabular structuring for self-study.

The developed mechanism for the design of multilingual education in the discipline “Phthisiology” serves as a tool for the development of educational and methodological complex in other medical courses.

## **Conclusion**

The obtained research results are recommended to be implemented into the real pedagogical process of the medical and other non-linguistic universities that provide multilingual education.

The significance of the results is determined by their focus on solving urgent and socially significant tasks of Kazakhstani society. A further study may be associated with the development of educational and methodological products that implement cognitive-communicative technology in teaching non-linguistic disciplines in universities.

## **Gratitude**

We express our deep gratitude to the leadership of Astana Medical University for the opportunity to study the problems of cognitive-communicative technology in the process of teaching students of multilingual groups and foreign students at the base of the Department of Phthisiology. Subsequently, the authors will publish methodological manuals on the implementation of this methodology for other medical courses in teaching non-linguistic disciplines of universities.

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