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The problem of correctness and reliability of the study in trilingual education

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Abstract

This article deals with the problem of correctness and reliability of experimental research methods and simulations of the basic research methods of decision the problem in a pedagogical experiment. Modeling of the educational process is used of the context with classical methods of research and modern innovative methods of self-education, co-education, cooperation and self-organization of the synergetic approach in pedagogy. In particular, the analysis and synthesis of classical scientific and methodical works on the subject of research are combined with the methods of modeling the educational process and mathematical modeling as an argumentative basis of the reliability of the results.

Key words: Synergetic approach, modeling, coeducation, cooperation, trilingual education.

El problema de corrección y fiabilidad del estudio en educación trilingüe

Resumen

Este artículo aborda el problema de corrección y fiabilidad de métodos de investigación experimental y las simulaciones de métodos básicos de investigación del problema en un experimento pedagógico. La modelización del proceso educativo se utiliza en el contexto de los métodos clásicos de investigación y los métodos innovadores modernos de autoeducación, coeducación, cooperación y auto-organización del enfoque sinérgico en pedagogía. En particular, se combinan el análisis y síntesis de trabajos científicos y metodológicos clásicos sobre el tema de la investigación con métodos de modelado del proceso educativo y matemático como base argumentativa de la fiabilidad de los resultados.

Palabra clave: enfoque sinérgico, modelado, coeducación, cooperación, educación trilingüe.

1. INTRODUCTION

Synergetic is the science of laws of self-organization of complex systems (Evin, 2008; Solodova, 2008). When preparing for the teaching profession and studying by students of such an interdisciplinary course, as "methods of teaching the Russian language" it is important to take into account the laws of complex dissipative systems, which was studied in the philosophy of instability of Haken (1983), Prigogine (2002) and his followers (Solodova, 2008). The philosophy of instability is one of the

ideological pillars not only in intercultural communication, as Zinchenko et al. (2007) write, but also in teaching languages. Instability is related to the idea of a nonlinear, non-reduced, multivariate future. At the heart of the philosophy of instability is the notion that chaos is productive, the order is unproductive because chaos contains an infinite number of degrees of freedom. Prigogine (2002) believes that "the phenomenon of instability naturally leads to very non - trivial, serious problems, the first of which is the problem of prediction" (Prigogine, 2002: 12).

Pedagogy as a science is extraordinarily complex. It is complex in the contiguous interlacements of hundreds of thousands of components. Also, the measure of its responsibility is not a detail, not a machine - man. (Zinchenko, 2007). In the system of trilingual education, we used integrated technology (Zaidullina and Demyanova, 2017). The term technology is in private didactics, which has entered the science in recent decades, involves a selection of approaches, principles, computer programs, which gives the result, and the effectiveness, correctness are checked in specially conducted methodical (pedagogical) experiments. Time is fleeting, and the world is developing rapidly, so the teacher of literature should be able to select the texts that correspond to today, to complement the material for classes. When modeling trilingual education, only traditional methods of General didactics and

methods of teaching languages, which describe the socio-cultural conditions of the functioning of each national education system. But also used mathematical models already used in synergetic to check the correctness of the realization of new synergetic principles are taken into account. The target model of the trilingual personality, the selection of content, principles and methods as parameters of the order have changed the organizational forms of determining the reliability of the experiment. Pedagogical experiment, more precisely for the private didactics methodical experiment, it was carried out in the new conditions of the fourth industrial revolution with the parallel assimilation of 3 languages. It is important that the implementation of new synergetic principles contributes to the preservation of national identity, thanks to the appropriate methodological system, and the method of pedagogical experiment is the basis for determining the reliability of the results (Tuan, 2017).

To show the logical sequence of research and implementation of innovative integrated technology, science-based subject in the system of trilingual education, will present in varying degrees fragments of several experimental studies, carried out in the scientific school under the guidance of Professor Kondubaeva (2015).

2. METHODOLOGY

It is known that the word "experiment" is of Latin origin and means "experience", "test". Almost all textbooks on the method of the Russian language for undergraduate students and Internet resources note that "the experiment in pedagogy is creative. In the experimentally, for example, new practice techniques, methods, forms, systems, training and educational activities" (Kondubaeva, 2015: 4). A methodical experiment in subject education is a scientifically-grounded experience with the purpose of transformation of the pedagogical process of teaching to linguistic discipline in the conditions of high and higher school in a linguistic study with an interactive whiteboard and a computer at each pupil or student.

For the implementation of the strategic goal to improve the intellectual potential of the nation and its spiritual revival, large-scale pedagogical research carried out by teachers and innovators together with outstanding teachers and psychologists. It is important in these studies to be in tune with the problems studied. And then, according to Shatalov (1998), the task was to teach to learn, "extract" knowledge by the students themselves as a result of self-regulation and self-government, using schemes, reference notes, to evaluate "only real values: knowledge, practical skills, diligence, creative burning". These studies were strictly checked by commissions, so the achievements of the Soviet education system of the period recognized the whole world. The integrated

technology research is in the preparation of teaching of the experiment is the hypothesis of the study, selected the experimental university group. Traditionally, the subjects should be at least 5-11 people and groups, where the proposed methodological system is implemented and the same number of people in control groups, where training is carried out under the current system.

In methodical experiment everything is controlled on all 3 stages of its carrying out. It begins with a starting experiment, which is also called the starting. The second stage, the training experiment is carried out on a new methodological system involves the introduction of innovative technology in the educational process. Finally, the third part is the control experiment. It was carried out similarly to the starting one, when the quality of training was tested on the new didactic material. We give examples of a pedagogical experiment performed under the guidance of Professor Kondubaeva (2015) in the research of teaching Russian language in secondary and higher education during the transition to a trilingual system of education. The first example of a pedagogical experiment on formation of the multilingual personality of the pupil of the 5th grade", carried out by the postgraduate student. Prigogine (2002) contains the short description of the experimental work which is carried out in natural conditions of educational process in schools of Kostanay and Kostanai region.

The pedagogical experiment was conducted in three stages: 1) ascertaining (diagnostic) in order to identify the starting level of knowledge and skills; 2) training or forming (in our case, multilingual person); 3) control (final). Parents determine the linguistic orientation of a 6-7-year old child. By the 6th grade, children have a desire for self-affirmation, a desire to have their own judgment, and it is at this age that the first conscious preferences for a particular language as a means of communication appear. Thus, the study highlighted both the negative and the positive aspects of the functioning of languages, which should be taken into account in the development of language programs in the school system.

At the secondary level students are focused primarily on the use and study of the Russian language. Certainly, it is due to the fact that a language of instruction for them, and for many people - relatives. However, it is alarming that the choice of types of multilingualism rate in a foreign language is more often than on the state, which in the future may create, in our opinion, certain difficulties for those who are not interested in learning the Kazakh language, the use of which as a state will expand. The results of the ascertaining experiment showed that the foundations of the phenomenon of real trilingual are being created today, one of the components of which, along with the Kazakh and Russian, is the German language. However, among the surveyed students of Russian schools is dominated by either the so - called receptive TLD - and trilingual ("I understand, but I speak badly or I do not

speak at all"), or partial TLD-and trilingual with a more complete knowledge of one (Russian) language and less complete second and third language. Underdeveloped communicative competence, low level of speech skills of the groups studied were other arguments in favor of the study of the problems of the formation of TLD - and multilingualism in school. A number of studies have been conducted on the basis of the target model of the bilingual and trilingual personality of a specialist in high school.

In the monograph Tolkinbayev "The formation of the linguistic personality of a lawyer" scientific and theoretical bases of formation of skills of professional speech of future lawyers are presented, stages of formation of the language personality trained on the basis of ready model of the bilingual personality of the lawyer who graduated from high school with the Kazakh language are defined.

Dwell in greater detail on the example of a didactic experiment on the formation of a trilingual language identity of the professionals in the financial sector in economic university.

Theme "Clichéd formulas in learning to communicate in the formation of the language identity of students-financiers" specialty 6D011800 - Russian language and literature (Ongarbaeva, 2016). The development of scientific bases of the professionally oriented methodical system of training of professional Russian speech-making activity on the basis of the Kazakh and in

interrelation with Russian language of the students trained in financial specialties.

We followed to the definition of "formula" given by (Ongarbaeva, 2016). We believe that cliched formulas are a certain expression used in certain situations of communication.

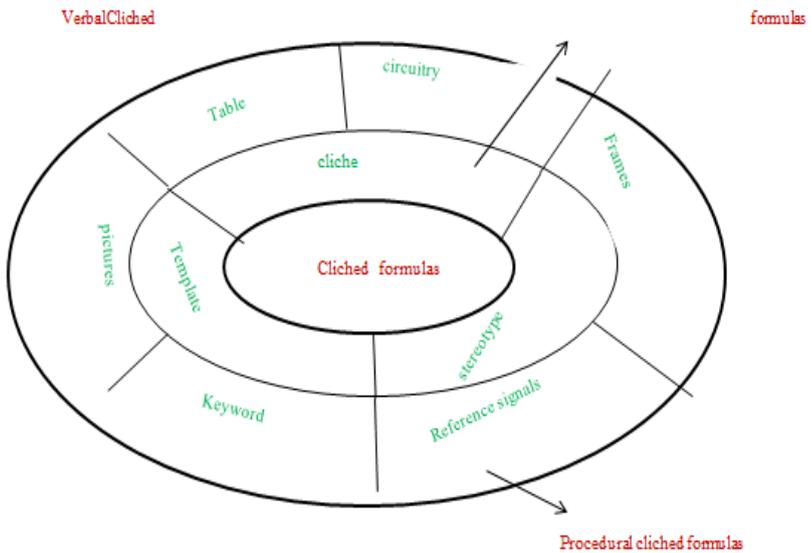


Figure 1. Model of cliched formulas

So, in figure 1, it is possible to draw the following conclusion that speech and language formulas, and also actually clichés belong to verbal cliched formulas. As noted earlier, the cliched formulas can be classified into 2 types: verbal and procedural.

Verbal clichéd formulas form the core of the content of our methodical system. The cliched formula is an exact verbal

expression, i.e. a ready-made revolution used as easily reproduced in a particular professional activity.

That is, it is actually a cliched, and language stereotypes and terminological minimum, facilitating memorization of words and phrases and terms in the study of the Russian language.

In turn, procedural cliched formulas are all types of schemes, tables and other means that facilitate learning by Association and help in the development of memory, thinking, first of all, critical, we have combined and summarized in the cliched formula.

Procedural cliched formulas are used as a component of the technology of teaching speech activity of the student.

For the best memorization of the material, a variety of schemes, tables, keywords can be used, which develop a visual memory of students in the study of the new material.

The transition to market-based forms and methods of management has led to significant changes and additions in the language of economists, entrepreneurs, which led to the emergence of many terminology dictionaries on the economy (table 1).

Table 1. The classification of clichéd formulas by the studied topics

Theme	Term	Cliched formulas: speech stereotypes
The vocabulary of scientific style	<i>Money</i> <i>Finance</i>	<i>Cash flow, cash flow, cash flow, financial means, financial stability, degree of self-financing, financial strength, financial potential, financial well-being, financial difficulties, financial condition</i>

As already noted, terminology is an important part of scientific vocabulary. So, the study of professional economic terms, we began with the use of associative exercises. On the question: "How can you explain the meaning of the term "credit"? -We asked to answer with a drawing, a scheme or an algorithm and to explain orally the associations. By the end of the 1st course, students of the experimental groups occurred at only clichéd, but also verbalization associated with the term. During the entire period of study, students mastered a large number of texts in the specialty in which the term "credit" has different types. This can be seen in the scheme, compiled by students of experimental groups, after the assimilation of the studied material.

So, for example, from 21 phrases on a subject "Credit" purely to the financial sphere of the use of the clichéd formulas 10 phrases belong, and the others can be attributed to General economic (Ongarbaeva, 2016). In means, loan is a Bank loan is a set of the relationship between the Bank as a lender and its borrower regarding the provision of the borrower a certain amount of money for the intended use (but there are also unrelated loans). In professional communication, there is a strict standardization language tools used.

Table 2. Clichéd formulas in Kazakh, Russian and English

Kazakh language	Russian language	English language
Негізгі мақсат	основная цель	The primary aim
Маңызды шешім	решающее значение	Decisive importance

According to statistics, such clichéd formulas are perceived many times faster in all 3 languages in the coordination of the content of

disciplines. These tables help students to understand the full, partial adequacy or inadequacy of cliched speech stereotypes. The following table in the lexical-thematic block presents the themes of the texts of experimental studies, which should be identical in the studied 3 languages. The topics of the texts reflect the spheres of financial activity, for example: World Bank, the National Bank of the Republic of Kazakhstan, currency, credit... The tests are selected from the monographs of the world's recognized economists, academician O. Baimuratov, A. Koshanov, O. Sabden, S. Satybaldin and recognized authors of textbooks on Economics and Finance: Fundamentals of Finance, Finance, Bank, money, credit, etc.

- Materials from economic dictionaries and encyclopedias legalizing the use of economic terms are selected as educational texts, and some journalistic articles from modern non-specialized Newspapers and magazines dealing with certain economic problems contribute to the repetition and consolidation of professional clichés of formulas in the speech;

- In addition, a specialist with higher education should be a cultural person and be able to read not only scientific texts in Russian, as well as artistic and journalistic, so the volume of such texts in our experiment and experimental work-from 20 to 30 percent.

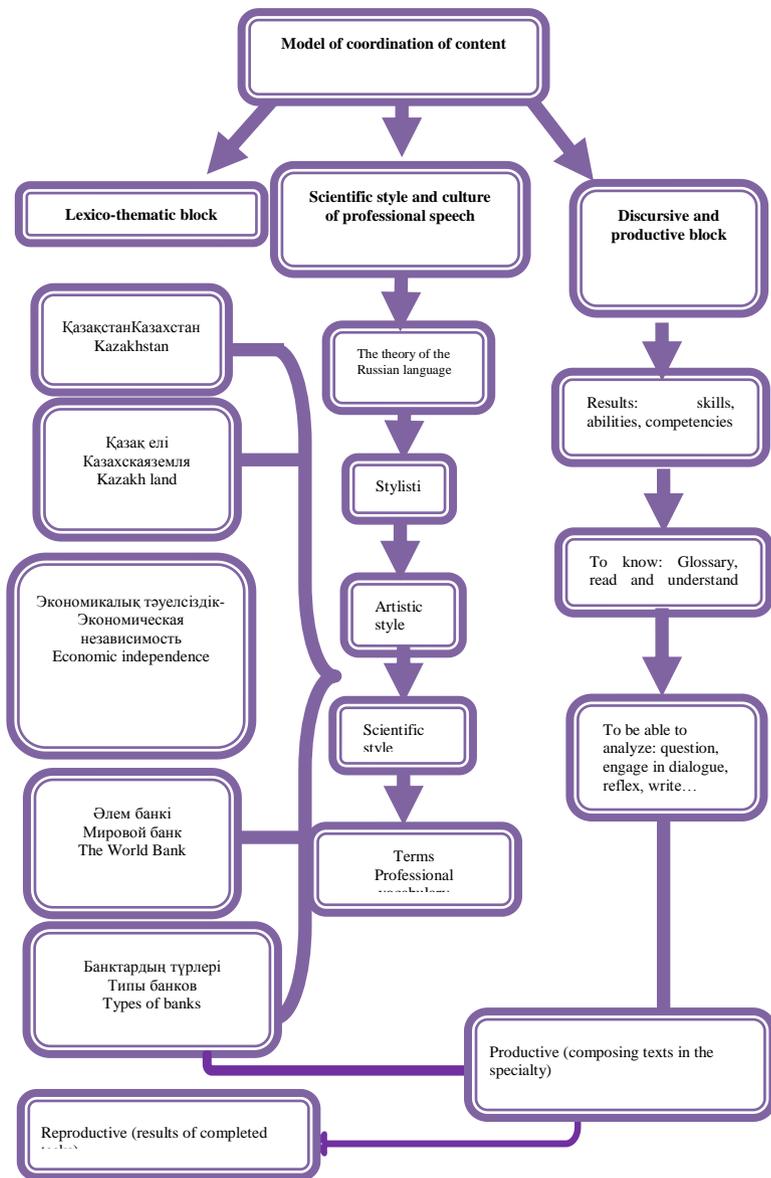


Figure 3. Model of coordination of content

Strategic elements include the choice of goals, situations, partners, conditions and subject matter. In the process of implementing the elements of the strategy manifested tactical elements: structuring of speech, the embodiment of the speech plan and the regulation of the communication process.

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Table 3. Cliched formulas in Kazakh, Russian and English

Kazakh language	Russian language	English language
Негізгі мақсат	основнаяцель	The primary aim
Маңыздышешім	решающеезначение	Decisiveimportance
Мүмкін, біз өз ұстанымымызды мазмұндауданбастағанымыз жөн болар	Возможно, нам следует начать с изложения нашей позиции	Perhaps we should begin by outlining our position
Жалғастырмасбұрын	Преждечеммыпродолжим	Beforewegoon...

As a result of determination of scientific bases it is possible to pass to the next stage of research – experimental work. Let us focus on the educational experiment on the formation of the trilingual language personality of specialists in the financial sector.

Purpose:

- 1) Study the level of perception and understanding of financial terms in the professional Russian classroom;

2) To implement the technology of the use of cliched formulas on the material of professional texts, which contain financial terms included in the terminology minimum selected by us;

3) In the control experiment, we compared the results of the perception and understanding of financial texts in the control and experimental groups.

Table 4. The program of the experiment

№	The theme of the lesson	The text on specialty	Cliched formulas
1	Professional culture and professional language	From the history of financial relations.	<i>Professional language, culture of professional speech, monetary payment, monetary relations, set of monetary relations, investment values, functioning of Finance,</i>
2	Features of the professional language	World market	<i>World currency market, international market, official market subjects, money resources, resource management, traditional consumers, commercial banks, investment banks.</i>
3	Culture of business documentation	Requirements for the language and style of documents	<i>Official-business style, culture of writing, business correspondence, company advertising, design of the agenda, introductory speech, preparation of negotiations, abstracts, draft decision, draft minutes of discussion, presentation of the project</i>

The experimental work involved 1st year students specialty in "Finance" - groups (6 groups in 2014-15, 2015-16 academic years) and "Accounting and audit" -6 groups in 2014-15, 2015-16 academic

years.), ("Economics" - 4 groups in 2014-2015, 2015-2016 academic years.)

Experimental work was carried out by 5 teachers of the Department "Kazakh and Russian language" Narxoz University by named T. Ryskulova. The experiment involved 200 students of economic specialties (Solodova, 2008).

Table 5

№	Academic year	Specialty	Group	EG.	KK	Total
1	2014-15	Finance	141,142,143	Fn. 141,	Fn. 143,	75
		Economy	141,142	Fn. 142	EA 142	50
		Accounting and auditing	141,142	EA141, EAA 141, 142	EAA 144	75
2	2015-16	Finance	144,145,146	Fn. 144,	Fn. 146,	75
		Economy	141,142	Fn. 145	EA 142	50
		Accounting and auditing	141,142	EA 141, EAA 141, 142	EAA144	75

So, as can be seen from table 5 during the study 200 students of specialties "Finance", "Economics", "Accounting and audit" in which were learned 150 cliched formulas and economic terms were learned in 90 hours of practical training, 15 SRS and the 2 lesson for rating control. At each session 10 clichéd formulas in 15 SPS. According to statistics, the average level of assimilation is 83%, the undeveloped level is 17%.

In the control experiment, we compared the results of perception and understanding of economic texts in the control and experimental

groups. In the pilot groups, learning outcomes were 30 percent higher. The implementation of the technology of using cliched formulas on the material of professional texts in experimental groups is higher than in control ones.

At the same time, students with a low level of perception and understanding of economic texts were allowed to use the notes made during the work on the text or the text itself. Students with an average level of perception and understanding of economic text was allowed to use only their records. Students with a high level of perception and understanding of economic texts did not use any supporting materials. This experiment really showed that the skills of perception and understanding of economic texts obtained in the lessons of the professional Russian language, the student will be able to practically use in preparation for other disciplines, such as "Economic theory". Consequently, the result is achieved.

№	Specialty	EG	%	KK	%
1	Finance	Fn 141, Fn 142	83 76	Fn 143,	67
	Economy	EA141,	80	EA 142	72
	Accounting and auditing	EAA141, 142	65	EAA 144	59
2	Finance	Fn144, Fn 145	69 70	Fn 146,	60
	Economy	EA 141,	77	EG 142	70
	Accounting and auditing	EAA 141, 142	73	EAA 144	65

On working curriculum discipline "Russian language" consists of 6 credits (on 3 credits on semester), i.e. on 45 hours on 1 semester and "Professional Russian language" - 3 credits on 30 hours.

The effectiveness of the teaching methods used for the introduction of the new theory into the educational process can be tested not only by the traditional quantitative analysis of the results of the discipline, but also by the mathematical model (Solodova, 2008):

$$(dx(t))/dT + Kx(t - T_3) = b(t). \quad (1)$$

The mathematical model described by this differential equation is called the zero-level model. The order parameter of such a model is the system memory. In equation (1), parameter $x(t)$ shows the quantitative characterization of the information learned in the learning process, i.e., the output (words, an average of 2700 words in the study of the Russian language in the economic University in the course of 90 classroom hours, as we have already noted, in terms of seconds is - 324 000), $b(t)$ to quantify the flow of input information (pages/sec-150 new speech patterns with the terms and about 300 words activated in the speech, K - the coefficient of perception of information by the trainees (4,5 units), T_3 - the time delay in the perception of information by the trainee at the beginning of the training experiment (seconds -270 C).

The block diagram of the system with memory, described by the differential equation (1), has a link delay in the feedback circuit, which provides memory (Fig.4).

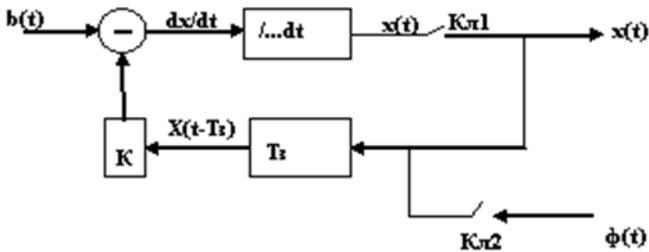


Figure4. Block diagram of the model with memory

To solve the equation with memory, it is necessary to set the initial function $\phi(t)$ in the time interval $t_0 - \tau(t) \leq t \leq t_0$, which, as a parameter of the model order, characterizes the system memory accumulated before the start of the training.

Suppose that $x(t)$ is a quantitative characteristic of the information learned in the learning process, i.e. the output information is proportional to the time interval, as well as the difference between the maximum information learned and the information learned at a given time: $\Delta x = (P - x)\Delta t$.

In the form of a differential equation, this dependence looks like this:

$$dx/dt = k(P - x).$$

Dividing the variables in this equation, we integrate:

$$dx/k(P - x) = dt;$$

$$-\ln(P - x) = kt + C.$$

Get function:

$$x = P - C_1 e^{(-kt)}, \quad (2)$$

Here C_1 is an arbitrary constant.

If $x(0) = 0$, if $C_1 = P$, the function (2) will be:

$$x = P(1 - e^{-kt}).$$

The graph of this function is shown in figure 5. It is a curve with saturation, where P is the maximum possible assimilated information

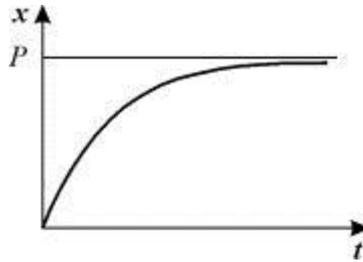


Figure 5. Information acquired in the learning process,
depending on the time

This graph characterizes the result of our experiment: the growth of information learned in the learning process (in this case clichéd speech stereotypes) reaches the required level with a delay of 100 seconds compared to 270 seconds at the beginning of the experiment. In the course of further fixing on SRSP and SRS in process of performance of tasks, the trainings from four to seven times individually for each student by preparation for rating control indicate the reliability of the results.

The correctness of such organization of the experiment is confirmed in studies of Bekalay et al. (2017), and the mathematical solution of the Cauchy problem in the application of our research described in the article "Mathematical modeling of the process of assimilation of scientific concepts by pupils of the primary school of the Republic of Kazakhstan" (Knyazeva, 2008).

System indicator of the quality of learning quantifies the rate of learning, the optimal duration of the lesson, the success of its assimilation with maximum consideration of the individual psychological characteristics of students. This indicator depends on the K – factor of perception and TK-time delay, determining the speed of the learner. Both coefficients are non-linear functions of x . It should be noted that both these parameters are random variables, depending on the health and age of the student, his memory, i.e. accumulated by the time of the beginning of learning knowledge, time of year, time of day. K - Coefficient of perception characterizes the emotional mood of learning.

3. CONCLUSIONS

Thus, on the basis of the developed model of trilingual multicultural competence, the volume of memorization of foreign words has increased; to improve the intelligence of students performed an independent task used by us in the process of working with economic terms in the classroom for professional Russian language in

the 2nd year at the Narxoz University. The increase in the number of memorized words occurred as a result of the selection of professional words and terms, their semantics and the use of methods and techniques to enhance speech-making with associative frames, schemes, and symbols.

The methodical system would not have been covered fully enough without the inclusion in the learning process, as we mentioned, of an electronic manual on the Moodle platform. The electronic manual prepared by us increases interest in learning by self-study and self-control, and, if necessary, its use for re-execution of tasks with minimal time spent on repetition (Ongarbaeva, 2016). The following tasks are presented in the electronic textbook:

1. Work in pairs. Students write terms, define the semantic relationship between concepts, groups of words are connected by straight lines with the key concept. The result is a structure that defines the information field of the topic, graphically displays the process of reflection, the relationship between the terms.
2. The preparation of the cluster based on reference material. Create a cluster by organizing the information in the reference materials (on the extramural economic term references material, representing the two genus-species-group, related to each other. Task: to systematize them, just find them generic-specific relationship).

3. The terminological dictation. The teacher reads definitions of terms used in the analyzed educational text, and students write down these terms themselves.

4. Solving crosswords. This technique can be implemented in both individual and group form. Students solve crosswords, which encrypted economic terms, taken from the previously analyzed educational texts. Each student or groups of teams get the sheets with the crosswords; the job runs at a time. Solved crosswords are checked by the neighbor on a Desk or other group-command depending on what form of realization of this task is chosen.

5. Group work. Each student received a card with the name of the topic, combining a number of terms considered in the analyzed educational text. The guys had to form groups, independently determining which of them they could join. The final stage of the task was to work on the formulation of concepts. Each group voiced articulated concepts, while the other group acted as a reviewer.

6. Level-differentiated task (for strong students): the student receives an individual card with the task on which the name of one of the special topics presented in the recently reviewed educational text is written: the person answering has to remember and write the meaning of terms relating to a given topic.

7. Work with graphs, charts, diagrams, etc., presented in textbooks, manuals on Economics: a) use the signature (appropriate terms) to analyze the content of the drawings; b) compare the objects depicted in the drawings; C) make an illustration of the story using the terms actualized in the text.

8. Use of multimedia tools is to disconnect a sound and to ask the student to comment on the process, to stop a shot and to suggest to continue the description of the further course of process, and to ask to explain the process at the demonstration of the educational film (addition to the educational text).

9. Performance of students with the multimedia presentation. Working on it and making a presentation develops speech, thinking, memory, teaches to specify, allocate the main thing, to establish logical connections.

10. Mental warm-up. A) Formulate one or two questions for reflection in order to guess what lies in the "mysterious box". B) Student who has made an economic object is asked several leading questions. C) Student writes on the blackboard the term used in the analyzed educational text. Another student sits on a chair with his back to the Board and guesses the term, asking any student of the group questions that require the answer "Yes" or "no".

11. A survey of the chain "Guess term!" The story of one student is interrupted anywhere and the right of reply is transmitted to another.

12. Training: a)"the fourth extra". It is necessary to remove the extra term in the row, to justify their choice; b)"Define by the description". It follows the description "guess" the appropriate economic concept; C) "Continue the offer", etc.

13. Making up stories for specific words (h/w). For weaker students: give the reference of the terms in a sequence corresponding to the training discussed in the text; for the intermediate level learners: the terms give no particular sequence; for strong students to make the "extra" words that are not used in the text.

14. «Writer». Make the texts in the form of an adventure story or the story about the journey with the use of studied economic terms or the story about the journey with the use of studied economic terms.

15. Create cinquain¹.The term. In addition, in the development of non-linear thinking, project tasks play a special role.

So, we considered the training of a particular discipline, According to Knyazeva (2008), as an "open system (environment)", which exchanges energy, information, knowledge in a complex

¹A cinquain is a five-line poem that was invented by Adelaide Crapsey.

structure. In the study group, then in the classroom learner, realizing himself (internal interests, motives, goals...), gets used to self-organize according to their abilities. The structure of activity consists of several relatively simple structures: first, the activities of scientists who prepared the standard program and the textbook, and secondly, the activities of the teacher of the University, the competence of the specialist, his skills:

- a) Increase motivation to work together,
- b) Organize collective training activities in the group,
- c) Create a psychological atmosphere of interest in information and the results obtained by joint efforts, in the application of knowledge - is the key to solving life's problems and the implementation of economic projects.

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