OTSM-TRIZ as a Technology of Training the Expert in Education

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Abstract

One of the problems of vocational education is the special case of a global problem – we can teach only that knowledge, which is already obtained, however this knowledge becomes outdated quicker, than it is claimed in professional activity. In this article the basic problems of organization of professional pedagogical education in college are analyzed. The author of the article carried out a ten-year experimental work creating the alternative model of training the specialists in education (preschool level) in a pedagogical college in Minsk (The Republic of Belarus). As a result this alternative model was accepted in a certain educational institution, and the program and electronic version of the manual for the teacher and students were developed. The model of work organization which is described in the article, is only one of many possible. The problems, which were solved within the framework of this work, can appear to be standard for those people who will create a course of professional training in other areas.

The peculiarity of the course is that educational technologies for students (future teachers) are worked out simultaneously with educational technologies for children under school age.

The main concepts

Introduction

The purpose of this article is to generalize the results of the experiment with establishing an alternative system of training the expert in education in a pedagogical college. The problems, which were to be solved in the process of this work, are described in that sequence, in which they became obvious. This project was named "Pedagogics of creativity" [6] and it united both college teachers interested in changing their methods of teaching and training the expert of preschool education, teachers of base experimental kindergartens and the most motivated to research activity students.

The traditional teaching methods of both students and small children are aimed at imparting new knowledge. As a rule, such an approach doesn’t form an interest for learning and thus it is not much efficient. Students’ cognitive interest isn’t formed and their creative

abilities are not developed. It's noticed that teachers use in their work the same methods which were used to teach them. The supposition arose: if teachers are taught with help of technologies of forming creative abilities, and they are aquainted with methods of children creativity development, then they will be able to apply these methods to their professional activity. This will improve the quality of education.

The tasks of the experiment and the conditions of their realization

In the beginnig of the experiment with establishing an alternative model of training the expert in preschool education we put quite simple tasks:

1. The course should provide the training of the teacher according to the qualifying demands presented by the bodies of educational system management (educational standards);
2. During the course future tearchers should be taught the skills to apply OTSM-TRIZ models to their work with children under school age, on the basis of educational material;
3. The minimum knowledge about mechanisms of classical TRIZ, OTSM-TRIZ models, bases of TRTL and ZPTC shuold be formed in students.

As a prototype we had at our disposal one model of applying OTSM-TRIZ in education, which was used in certain schools at that moment: the course in PTV, organized as a independent subject.

This became the first obstacle in the realization of our purposes.

It wasn't difficult to organize our work using the example of this prototype. It was enough to work out the programme of optional classes, which would include studying OTSM-TRIZ bases, description of techniques of speech, thinking and imagination development, and the system of practical trainings for students, and to teach one or two teachers who will supervise the course. But as it's always happens the given conditions imposed the restrictions resulted in the necessity to choose another approach:

1. The existing centralized administrative system of education does not allow the introduction of the optional course which has been not affirmed in the educational plan;
2. At the beginning of the experiment there was only one teacher who was ready to work in an experimental direction.

Thus, we had the following task: the special course was necessary, but it was impossible under given conditions to organize it as an independent course. Therefore

we decided to develop technology of teaching professionally important subjects through application of OTSM-TRIZ models, including whenever it's possible the minimum theoretical fund as an example of processing the educational information and through organization of the students' research activity. The latter was represented by the following forms [7]:

The search work within the framework of a lesson, when the students created card files on their own, processed them and received the certain theoretical product: they built definitions of pedagogical concepts, systematized materials on the history of the pedagogical thought development, revealing laws of the development, made connections between the contents of different disciplines (pedagogics, psychology, physiology, history etc.);

The individual and group educational projects of theoretical and practice-oriented character (the analysis of the biographies of outstanding pedagogues from the point of GSTL view, the influence of a historical level of world outlook on formation of the creative personality, "childhood of the creative personality" under the conditions of social system of education, working up the projects of the multifunctional game manuals). These projects had practical result socially significant for the students: the GSTL projects led to the idea to create card files of unusual striking effects which can provoke an emotional response in a 3 to 6 year-old child, play a role of "Meeting a Miracle". The best works were published in an information bulletin of the "Pedagogics of creativity" project and in collections of works of students' scientific society, the designing of the multifunctional manuals resulted in creation of a technique of designing multifunctional toys and games, which allowed not only to get original projects, but also to master some RTV and TRIZ methods and principles.

The system of practical tasks to be fulfilled during practical activity in a kindergarten.

It's obvious that such a decision resulted in a number of new problems.

The main problems and the ways of their solving in the course of realization of the experimental work tasks

The problem of imformality of the experiment. At that moment any research activity of a college teacher was approved of, however, offiaial status was mainly given to those themes in realization of which the scientific and methodical service of a college was interested. In the rest of cases the administration of a college didn't make obstacles

to the leaders, but it also did not promote them. In order to solve the problem the following tactics was chosen: the analysis and solution of problems with official themes of researches were carried out by OTSM-TRIZ mechanisms. Such tactics made the scientific and methodical service of a college to pay attention to functionality of the approach.

The problem of contents of the academic programmes. The programmes authorized by The Ministry of education, are focused on the classical contents of educational material on pedagogics and psychology. Introduction of fundamental changes into their contents under our conditions was problematic: the educational system has cetralized managemant and does not allow it. So there was a contradiction: the programme of a subject should not contradict the official demands. And it should be innovative in order to meet the purposes of the experiment.

In the beginning we tried to introduce additional themes into the traditional programme, but we were quickly convinced, that this did not solve the problem. According to our final decision a "variational section" is supposed to be worked out in addition to each section of the standard programme authorized by Ministry of education. In this "variational section" it is describeb what representations from OTSM-TRIZ are formed on the contents, what models are used at lessons, and what themes of the research projects are possible basing on this material.

For example, studying of the history of pedagogics through the system analysis we expose the laws, according to which educational models changed one another, the bases of TRTL were studied taking as an example the life and activity of outstanding pedagogues of the past. As the basic models the system operator and models of contradictions are used here [10, 14].

As the elements of research activity students carry out the projects in analysis of outstanding pedagogues' biographies,the card file of natural phenomena, physical and chemical effects, demonstration of which can provoke children's surprise (the prototype of "Meeting a Miracle")is made up. All this was done at the level of one subject (preschool pedagogics). At the same time the contents of the programmes on individual techniques were corrected: introduction of OTSM-TRIZ technique of children's speech, thinking and imagination development became compulsory. Later when a new educational discipline called "Introduction in a speciality" appeared the part of the material was added to the contents of this new course: its main contents were

introduction to basic competences, which will be formed in future experts, among which much attention is paid to abilities to make creative products and to organize one's own research activity. Thus, the listed below trens of the work were added to this new course:

1). The GSTL projects. Besides traditional reports based on the analysis of outstanding pedagogues' biographies, a new project which was conventionally named "Meeting a Miracle in preschool childhood" appeared (it was mentioned above). The gist of this project lies in the collecting of interesting facts, description of the technique of work organization in demonstration of elementary physical and chemical experiments, examining of photos of natural phenomena or unusual objects. The project enabled the skill of compiling card files to be formed (as our observations showed, the majority of basic school graduates are not skilled in this area).

2). Principles of creative imagination development. Directed (creative) imagination is considered to be one of the professional competences, necessary for forecasting the development of both an individual child and general educational process on the whole. Such non-algorithmic methods from a traditional RTV course as "The Morphological analysis", "The Method of focal objects", "The Method of analogies", G.S.Altshuller's "Principles from fantogramm" (simple principles of imagination) were also reffered to as RTV principles. The students were later acquainted with a technique of these principles usage during the course of pedagogics and in individual techniques. Here the principles were used to form the skill of directed imagination of future teachers, that helped to understand those mechanisms, with help of which process of imagination is directed.

The problem of training the teachers of other professionally important subjects. Taking into consideration that by the beginning of our work in Minsk the participants of the project "Jonathan Livingstone" had organized a system of training TRIZ-PEDAGOGICS seminars, two of them being based in a college (this training was supervised by Sidorchuk Tatyana Alexandrovna, the certificated TRIZ-EXPERT), we managed to train practically all the teachers of individual techniques who wanted to study. Besides, the permanent system of individual consultations was organized, and the library of methodical materials in OTSM-TRIZ-pedagogics was based in the classroom of pedagogics, which was available for both teachers and students.

The problem of vocational education traditions which dictate the "rule": it is necessary to teach classical approaches in psychology, pedagogics, individual techniques in higher educational establishments and colleges, and innovational technologies are taught in the system of professional skills improvement. So the contradiction arises: an expert with a diploma of vocational education, should be skilled to independently chose technologies for qualitative work. But he/she is not skilled to do it, and has rather a superficial idea about these technologies. And practically he/she needs to be retrained at once. This problem was one of the first problems, which were be solved during the development of the course.

Its tstandard solution is to introduce the study of different technologies to the contents of education. However, modifications only at the level of the contents of education lead to the following contradiction:

The period of education should be prolonged, in order to train students for independent work better. But the period of education can not be long, but it should be as short as possible,so the students can begin independent work as soon as possible, and **time and means expenses spent on training** can be reduced.

We solved this contradiction through organization of students' research projects. The gist of the project activity is that students study one of the new pedagogical technologies independently in temporal small groups, analyzing literature and studying (whenever possible) its application in practice. Then the results of this search work are represented in an educational auditorium to all the participants of the academic group. It allows to save lecture time, guarantees clear representation at least one of the technologies, forms the skill to make an independent choice of the most adequate approach for solving educational problems.

At the same time, there was a group of some teachers of such professionally important subject as psychology, and it was impossible to motivate them not only to change the way of their teaching the course, but also to get aquainted with TRIZ-PEDAGOGICS. Under such conditions a new problem arose: the specific sharacter of cognitive processes (in particular of thinking and imagination) in preschool childhood is studied in details in a course of psychology, but it was impossible to introduce an element of the new contents into this course because of the "human" factor.

To solve this problem, we introduced the necessary contents into a course of pedagogics through search work at a lesson in the form of comparising the contents of

skills of thinking, which are traditionally studied in psychology, and skills of powerful thinking.

The problem of organization of practical work of students included into experimental groups: practical lessons based in kindergartens are organized with small groups of students (up to 8 persons). in the college. A methodologist works with each of these groups. It was not taken into account, what technologies were applied in base kindergartens, And whether a supervisor of practical work had necessary knowledge of OTSM-TRIZ-pedagogics. As a result the students had an opportunity to apply in practice those mechanisms, which they studied at the lessons, but they had no opportunity to see the results of systematic use of the technology: the students conducted practical lessons only 1 day a week. Only in 2002 there appeared the base grounds where OTSM-TRIZ-pedagogics was used as a system and where it was possible to observe the result.

As a variant of the solution of this problem we tried to use role games as often as possible at the lessons: one the students took up a role of the tutor, and the others – roles of children of a certain age. So, identifying themselves with children of a certain age, the students learned to reflect processes which occur at conscious and subconscious levels, they learned to reveal the reasons why children have problems in the process of their learning.

After the first experimental group was released (1995-1998) it became clear, that it is necessary to reconsider essentially the model of the future expert. It is not possible to achieve crucial reforms through the change of certain themes in the programme. In the development of this model we were guided by "approach through ability", which was developed by the methodologist V.V.Mackievich. In this approach the ability is defined as an appropriated way of action[9].

Another new trend at the subsequent stages of experimental work was **work with pedagogical problems**.[6] The need showed itself as a problem: to form the skill of working with a creative problem it is necessary for students to work with real problems, and for this purpose the motive is necessary. Taking into account that a motive appears when a person comes across a problem important for him/her we formulated a hypothesis: if we use the algorithm of solving inventor’s tasks to solve professional problems, we can form such way of thinking of a future expert, which is necessary for qualitative revealing and solving problems in pedagogical activity. And

this will allow to learn how to apply the technologies of forming such way of thinking in 3-6-year-old children.

Looking for solution of this problem, and also taking into account the need of forming students' skills to solve inventor's tasks and to apply the algorithm, which they will use in their work with preschool children, the technique of the analysis of pedagogical problems was worked out. This trend of the work allowed to reveal the urgency of another important problem that is a necessity to form system vision of not only particular courses, but the whole professionally important cycle, which consists of:

Pedagogics – the study of laws of upbringing and education organization.

Psychology – the study of laws of a child development at different age stages.

Individual techniques – the branches of pedagogics studying laws of training in a certain direction (development of speech, pre-mathematical training, musical education etc. - by analogy with school subjects).

Anatomy, physiology and hygiene – the study of laws and conditions of physical formation of a child.

The subjects of specialization - training of an additional speciality which is on demand in preschool education. In our case those specialities were "the musical supervisor", "the instructor in physical training", "the teacher of foreign language in a kindergarten", "the instructor in art activity", "the tutor of logopaedical group", "the supervisor of children's theatrical studio".

Each subject is taught by an appropriate expert, who has a diploma of higher education and profound knowledge in his (her) sphere. Thus, the contents of a subject programme is a system of standards in every discipline. It means, that the quality of mastering a subject is evaluated according to accepted scale (Today in Belarus it is a 10-mark scale), where the basic criterion of evaluation is the parameter of various degree of being in the know: knows -- does not know, has some knowledge.

It was noticed, that striving to fully reveal a topic every of the teachers includes information from all adjoining subjects in his/her lecture, and, as a rule, does not accentuate what area this or that or knowledge has been taken from. It does not form understanding of crossdisciplinary level. For example, it is not clear, what for it is necessary to know, that a preschool child has gristly structure of a skeleton, though it is obvious, that it is the reason why children get tired quickly when they are in a static

position for a long time: kids can not sit in one pose for long, it leads to development of scoliosis.

We established crossdisciplinary connections during the study of each theme (in all subjects) discussing, what knowledge from other subjects of a professional cycle can help us in the given branch of knowledge.

It was planned, that the course of pedagogics would aquaint with bases of OTSM-TRIZ-pedagogics, basic models, trainings to form skills for working with these models, and also with some opportunities of applying these models for development of speech and thinking of preschool children. During a course of individual techniques they were supposed to master ready –made techniques of development of speech, thinking and imagination of preschool children which were worked out in TRIZ-pedagogics. For this purpose the contents component was worked out and should have been realized in each of the techniques. Actually we didn't manage to accomplish it.

Some reasons of failures in the course of realization of the experiment's tasks

The additional contents was not a compulsory part of the programme authorized by the Ministry, and weren't introduced into the educational standard;

the teachers of the techniques were not skiledl to work with these techniques, and it is practically impossible to form a student's skill when a teacher is not able to use a technique. Therefore this material was taught only at informational level. We have found a way out of the situation in organization of individual consultating for the students about application of presented techniques. The consultating was based in the classroom of pedagogics and in base preschool institutions, where these techniques were applied.

Thus, in our case the experiment had an amateur character for the whole period of 10 years. For its successful and full value realization it needed an administrative resource.

Some achievements of the teachers and students - participants of the experiment:

1998:

The work of the leader of the "Pedagogics of Creativity" project was awarded a prize from Special fund of the President of Belarus "For the Personal Contribution to Development of Gifted Youth Abilities";

The multifunctional didactical manuals of the students S.Jukhnevich “Doll Masha" and M.Ivaniuta "The Stove" won the first place at the national contest of pedagogical skills.

2000:

On inquiry of a preschool institution the students conducted the first training seminar for the tutors of a kindergarten about the usage of the OTSM-TRIZ tools in teaching 3-6-year-old children.

2002:

The course project of the 4th year student T.Diomushkina "Designing Inventive Problems on the Basis of Fairy - tale Plots" won the third place in the competition of the college students’ projects, and the article "Development of Children’s Creative Abilities Using TRIZ Elements " was awarded with a special prize "For Scientific Conscientiousness" at the International conference in Chelyabinsk (Russia).[4]

2003:

The grants from Minsk city administration for development and realization of the projects "Scientific and Methodical Ensuring of Professional Training the Tutors of Preschool Institutions on the Basis of TRIZ-Technology" (A.Korzun),

"The Object Developing Environment for Realization of the Program "Pralieska"[1] by Means of TRIZ-Technology" (the team of the teachers of kindergarten No.464 under the supervision of N.Tiatiushkina).

The deputy of the head of experimental kindergarten No.519 S.Kishko is awarded with a special prize of Minsk city administration for popularisation OTSM-TRIZ in preschool education of the capital.

The students’ works are marked at an annual conference of student's works in the college:

The report "The System of Creative Problems aimed at Formation of Skill to Analyze Problem Situations at Senior Preschool Children” by Z.N.Kovalkova , in which the need in regular extra-curricular training work with children aimed at formation of

[1] “Pralieska” – program of preschool education in Belarus.

intellectual skills necessary for analysis of problem situations and their solution was underlined. This report won the first place in a competition of course projects[5].

The report "Training Children of Preschool Age Skills of Realized Classification of Objects of the Material World" in which O.V.Verashchaka accentuated that preschool children are not formed an ability to make classifications according to certain bases. She also offered the algorithm of work on creation of such games by teacher her/himself, and also the complex of 25 author's games was offered. The work won the second place in a competition of course projects[3].

O.V.Zinkievich presented the research work on the topic “The Pedagogical Problem as a Social Phenomenon". The algorithm of solving a creative problem was used as the basic tool for solving pedagogical problems[6].

The report "The Preconditions of Development of a Child’s Creative Potential in Preschool Institution. Childhood of a Creative Person" in which T.L.Orlova accentuated a problem of ensuring conditionsnecessary for forming the qualities of a creative person already in preschool age, in mass preschool institution.

N.Susha as a theme for meditation presented her pedagogical essay "The Pedagogical Problem. Is there a Problem? ", which won the first place in a competition of pedagogical essays of final year students. In this work the author reasons on the essence of the pedagogical problem and necessity of mastering practice of its analysis and solving.

2004:

The course project of students K.Novikova and T.Miranovich "The Development of Dialectic Thinking and Directed Imagination of 5-6-year-old children on the Basis of the System of Games by N.Kozyreva "The Round Dance of Fairy Tales" won the first place in a competition of course works and is awarded by a special diploma of the student's scientific society. The project was carried out with the purpose of applying in practice the system of author's games by N.Kozyreva "The Round Dance of Fairy Tales". The students made necessary graphic materials, developed the system of training lessons for 5-6-year-old children, formulated the recommendations for application of these games.

The conclusions about necessary conditions for creating a model of vocational education in a pedagogical college

So, if to speak about the system of work organization in a pedagogical college, from our point of view it is necessary to do the following:

To change the educational standard (qualifying characteristic) of a young expert. To reconsider and correct the educational plan in the speciality (for the whole term of education), in perspective not only in subjects of professionally important cycle, but also in all humanitarian disciplines.

To integrate the contents of the programmes of professionally important disciplines with OTSM-TRIZ. In our case it was done for the programme of preschool pedagogics and the contents of individual techniques was corrected (at a level of variational component)

To change from the reproductive method to the research method of teaching at least professionally important disciplines.

To introduce a collective way of training (KSO) at a lesson as the main form of work with new information. Such forms of organization of training are necessary which are built on the principle: "not that person learns who is taught but that one who learns himself".

To retrain and supervise the teachers of professionally important disciplines. There is a separate complex of problems, starting with necessity of creating motivation for changes, and including the formation of ability to reveal and to solve actual didactical problem. We were forced to carry out all mentioned above in the course of pedagogics.

For example: the technique of speech development solves the problem of " The preschool child's inability to made a figurative story", the technique of training the bases of mathematics - "The Problem of Preschool Children Perception of an Arithmetic Task Terms", the technique of training the skills of reading and writing "The Difficulties of Transition from Sound-Letter to Fluent reading" etc.

To change the approach to planning. The college teachers use the calendar-thematic planning: the sequence of themes study is distributed during the given time period. The form of lessons organization (practical work, a lecture etc.) is shown in the plan, visual aids are planned, the references to the literature are given. We have changed the plan with the purpose of ensuring the technological character. Clear

definition of the purposes and results of teaching process are formulated for each lesson: what to know, what to understand, what to be able to do …

To radicallly change the program of practical work in preschool institution. The practical tasks should be clearly coordinated to the contents of subjects of a professional cycle. While distributing students for practical work the position of a methodologist in relation to OTSM-TRIZ in education should be taken into consideration. Also the tough selection of practical base is necessary. In the preschool institution there should be teachers, who build educational process on the basis of our approaches.

It has been noticed that students' activity motivates teachers to study the OTSM-TRIZ approaches in preschool education. Hence, a question of retraining or improving professional skill of teachers arises. This is carried out today by the system of institutions of professional skills of teachers improvement. However, in ideal, such work would be realized by the college. But this is not accepted by traditions of postgraduate education of our system.