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Future teacher training to cope with pedagogical tasks in small group through e-learning

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***Abstract* — pilot training of future teachers at Novokuznetsk institute (branch) of Kemerovo State University is described in this article. The most important direction of education is future teacher training to cope with pedagogical tasks through electronic education (e-learning) on the basis of LMS Moodle jointly with the organization of students' self-learning in small groups. The following objectives are formulated: to confirm the suggestion that using e-learning methods jointly with the organization of students' self-learning in small groups increases the effectiveness of future teacher training for meeting pedagogical tasks; to identify the optimal level of task complexity of self-learning for meeting pedagogical tasks using the method of cognitive modelling. The authors implement the modern concept of training of future teachers based on the competency building approach and a modular structure of the educational program. Pilot training allowed to assess the process of education, to prepare recommendations on improving the main educational programs. The authors' educational technology was created and realized to achieve defined objectives. The material submitted is interesting to heads, teachers and scientists dealing with problems of teacher training and will allow to replicate the results of the study in education practice of other universities.**

Keywords — small group teaching, e-learning, information technologies, teacher training, pedagogical situation, pedagogical task, cognitive maps.

I. INTRODUCTION

Earlier, we described the process of teacher training with the use of group work and e-learning at Novokuznetsk institute (branch) of Kemerovo State University [1].

It was noted that there were the following problems in the process of teacher training:

1) a different entry-level of teacher training varied from advanced one (students have a preliminary experience of scientific work, have basic knowledge and skills in the fields of chosen subjects, plan their own processes and are capable of independent professional development) to low-level (students have a low basic level of training on chosen subjects, do not have an experience of scientific work and are not capable of planning their own professional development);

2) a lack of pedagogical tools of future teachers' skills formation in dealing with pedagogical objectives, mentorship and group work in the learning process of basic subjects of the educational program;

3) a lack of effective forms of students' self-learning organization in preparation them for teaching, insufficient motivation to self-learning, performing tasks, etc.

Moreover, the present-day scientific and technological progress and development of information and communication technology have led to contradiction between students' requests and opportunities of university education practice. For example, it is noted that traditional education has a number of the negative features related to a teacher's position [2].

It was decided to use e-learning methods on the basis of LMS Moodle jointly with the organization of students' self-learning in small groups to overcome the problems and contradiction of future teacher training.

We described the educational technology which includes students' preparation for future teaching and for meeting pedagogical tasks. The technology is based on using e-learning methods on the basis of LMS Moodle jointly with the organization of students' self-learning in small groups.

II. MATERIALS AND METHODS

The following approaches were used to cope with the tasks of the study with the help of the implemented educational technology:

- e-learning,
- small group training,
- project-based learning,
- the method of cognitive modelling of pedagogical situation.

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It is necessary to note that face-to-face training did not change and was traditional. Students attended lectures and seminars, did practical and lab exercises, sought to advice from a teacher.

The changes have affected only the organization of students' independent study provided by a training plan with established time limits. According to the educational program, the approximate ratio between face-to-face and independent training is 50/50%

E-learning realizes the new model of the education process based on infrastructure which provides basic and additional services and organization of a user base, integration with external databases, setting of rights and roles of actors of the education process [3].

Using Moodle for realization studies on education online-strategies may be often found in publications [4].

Students learnt the subjects in accordance with the education plan and did self-learning exercises in LMS Moodle. Teachers offered exercises for self-learning and provided advisory support, mid-term and final monitoring. Different elements of electronic courses offered by the system were used in the preparation of exercises and pedagogical situations: lectures, four forms of task (a file as a reply, several files, an answer on a page and oral reply), testing, questionnaire, poll, development of a glossary and wiki.

The main feature of our educational technology became future subject teacher training in small groups in which students were trained doing self-learning exercises to analyze pedagogical situations and meeting pedagogical tasks through interaction between actors of a group with the use of the information and communication technologies such as teleconference, participation in chats and forums, e-mail, social network.

Researchers note that small group work stimulates students to be independently active regarding to new knowledge generating, to transform the education process from "teaching" to learning [5].

The following opportunities as the main changes between small group training and traditional education in big groups are [6]:

- students' focus on figuring out applied exercises,
- constant dialogue (discussion) between actors of a group,
- students' mentoring characteristics,
- more accurate feedback in the education process,
- self-evaluation of meeting the tasks at all stages,
- development of students' group work skills,
- planning personal student development,
- involving of one group members by others.

These opportunities are more relevant for future teacher training because they allow, in addition to learning, to develop the most important competencies of teaching related to the analysis of pedagogical situations and meeting pedagogical tasks.

It is noted [7] that teachers actively take part in small group work, provide realization of the education plan, educational standard through the choice of relevant education methods, formation of comfortable learning environment and also assessment of small group work and individual students.

The authors noted that the most important result of small group training is obtaining competencies of group activities when students learn new roles [8]. Moreover, scientists' attention has been drawn to the problems of group organization, students' opportunities to change a group. In particular, students related to the constant group were involved in the system of group values more successfully than students who changed their groups. It is necessary to transform the levels of activity from individual to group, depending on the objectives of studied subjects.

III. ORGANIZATION OF PILOT TRAINING

The organization of small group work of students in the process of education allowed successful students to be mentors, to teach untrained students and to manage difficult tasks implementing. That training has shown the high efficiency but it was not statistically confirmed because the most important thing at that stage was to improve the organizational issues and form a bank of exercises of different levels.

In the future we set a target to do an experiment allowed to assess more accurately the applicability of the implemented educational technology and to confirm its effectiveness. That is why it was necessary to identify:

- a list of the educational programs of teacher training for participation in the experiment,
- a list of courses for group training realization,
- the most effective complexity of exercises in accordance with a subject,
- a size of a group showed maximum effectiveness of education.

The basic installation when choosing the subjects was the established educational practice at university, availability of complex tasks and project in examining the courses. The most detailed and difficult subjects were pedagogy and psychology. The key direction of education in accordance with these courses was students' preparation for meeting pedagogical tasks.

The prepared teaching materials, programs, educational tasks, handouts, etc. are developed by us on the basis of the state educational standard and are aimed at using the method of cognitive modeling [9], project forms of training through quasi-professional integrative activity in small groups [10].

Pilot training had been conducted for three years, more than 200 students studying "Pedagogical education", "Pedagogical education with two profiles", "Informatics", "Mathematics", "Informatics and Physics", "Informatics and

the English language", "Technology and Informatics" were involved in the training.

In the first year, an experiment was conducted to determine the effectiveness of the method of cognitive modeling in the process of preparing students to cope with pedagogical tasks and to confirm the lack of negative impact of new and revised sections on the study of traditional sections of the course. 56 students studied supplemented by sections actualizing cognitive modeling.

During the pilot training, students' preparation for the analysis of pedagogical situations and meeting pedagogical tasks was assessed twice – before the students studied the experimental groups of sections related to the method of cognitive modeling of pedagogical situations and after their study. The criteria and evaluation apparatus developed by us show that each student, in accordance with the level of training, could fall into one of four categories: low, medium, high, very high.

The initial size of small groups was chosen on the basis of medical students' training [11]. In the presented work, taking into account the specificity of teacher training, the following compositions of small groups were defined: 3, 5 and 10 people.

Teachers used the method of cognitive modeling of pedagogical situations, well-known interactive teaching methods (heuristic method, method of nominal group technique, method of brainstorming, methods of extrapolation and analogies, method of organizational modeling, Delphi method, method of synectics, etc.).

Students received the special tasks with the wording of pedagogical situations, created cognitive maps and carried out the analysis of pedagogical situations on the basis of them. The solution of a pedagogical situation consisted in the formulation of pedagogical problems, and also recommendations on their elimination.

The complexity of pedagogical situations was characterized not only by the number of actors involved in it, but also by the importance of pedagogical problems a student faced.

During the academic year, teachers structured the content of training in courses, prepared practice-oriented tasks and pedagogical situations of different levels of complexity. The time spent by one student on task implementation was a criterion for the complexity of the task.

IV. RESULTS

During the pilot training, students' preparation for the analysis of pedagogical situations and meeting pedagogical tasks was assessed twice – before the students studied the experimental groups of pedagogy and psychology sections related to the method of cognitive modelling of pedagogical situations and after their study. Training in control groups was carried out in the traditional way and in the experimental groups students carried out self-learning in accordance with the proposed authors' technology which implies that they met pedagogical tasks in small groups through e-learning.

According to the criteria and evaluation apparatus developed by us [12], each student, in accordance with the level of training, could fall into one of four categories: low, medium, high, very high. The results of the formative assessment of the level of preparation of students of both samples to cope with pedagogical tasks are reflected in Table 1.

TABLE I. THE FIRST ASSESSMENT OF THE PREPARATION LEVEL OF STUDENTS FOR THE ANALYSIS OF PEDAGOGICAL SITUATIONS AND MEETING PEDAGOGICAL TASKS.

	Low level (people)	Medium level (people)	High level (people)
Experimental group (sample of 50 people)	17	27	6
Control group (sample of 50 people)	15	25	7

The statistical analysis allows to suggest that the first diagnostic verification showed equal probabilities of students' distribution by the experimental and control groups, taking into account the levels of preparation for meeting pedagogical tasks.

The results of the secondary assessment of the level of preparation of students of the experimental and control groups to cope with pedagogical tasks after the end of the study of courses with supplemented and new sections related to cognitive modeling for the experimental groups are reflected in Table 2.

TABLE II. THE SECONDARY ASSESSMENT OF THE PREPARATION LEVEL OF STUDENT FOR THE ANALYSIS OF PEDAGOGICAL SITUATIONS AND MEETING PEDAGOGICAL TASKS.

	Low level (people)	Medium level (people)	High level (people)	Very high (people)
Experimental group (sample of 50 people)	3	9	27	11
Control group (sample of 50 people)	15	32	3	-

We also considered the results of the secondary assessment of the level of training of the same 50 randomly selected students of the experimental group (before and after training cognitive analysis and modeling of pedagogical situations) to determine the degree of effectiveness of the educational technology and the method of cognitive modeling during professional training of a future teacher of Informatics.

Even a visual comparison of the distribution allows us to conclude that the distribution function in the experimental group differs from the distribution function in the control group at the two stages of the experiment. Thus, the results of the secondary diagnostic assessment showed that the course of cognitive modeling has a significant impact on the process of preparing students to cope with pedagogical tasks.

Subsequently, during the improving the methodological system consisting of the content, forms and methods related to the used educational technology and the method of cognitive modeling of pedagogical situations that ensure the self-learning of future teachers, the technology was used not only during studying pedagogy. A similar experiment in which two

streams of 87 and 89 people participated was conducted. 87 students used cognitive modeling studying the course "Methods of teaching subjects (informatics)" (the experimental group) in small groups, 89 students studied the standard course "Methods of teaching subjects (informatics)" (the control group). The sample consisted of 85 people in each group.

On the basis of distribution functions, it can be concluded that through the successful process of preparing students for the analysis, forecasting of development and decision-making in pedagogical situations the results in the experimental groups are statistically higher than in the control groups.

Thus, we have confirmed that the implemented pedagogical technology based on e-learning methods jointly with the organization of self-learning of students in small groups, provides training for students to make decisions in various situations of the educational process and increases the readiness of a future teacher to integrative activities.

One of the objectives of training was to find out the optimal composition of the groups in the context of the courses studied. One of the proposed assumptions was a relationship between the content of certain courses, the optimal composition of small groups, as well as the complexity of the tasks offered to students.

Training confirmed our assumption. In some cases, it turned out that working on the tasks was effective even individually. However, in this case, the total effectiveness of training in small groups was confirmed.

As a result, the optimal ratio of the composition of the groups and the complexity of the proposed tasks were selected (Table 3).

TABLE III. THE OPTIMAL COMPOSITION OF SMALL GROUPS AND RELEVANT LEVELS OF THE COMPLEXITY OF PEDAGOGY TASKS.

Course name	The optimal composition of groups 1 (traditional training), 3, 5, 10 people	The optimal complexity of tasks 1, 2, 3, 4 levels
Pedagogy		
– the best result	3	4
– a “second-best” result	5	3

The results of the analysis of the time of self-learning of students studying in small groups in comparison with the normative requirement of the educational standard were important (Table 4). In traditional training, teachers often noted a lack of students’ motivation to self-study of courses, complained about a lack of preparation of students for classes, failure to cope with tasks, etc. Training in small groups showed that the actual time of self-learning of students has increased significantly.

TABLE IV THE COMPARISON OF NORMATIVE TIME ON SELF-LEARNING OF STUDENTS AND ACTUAL TIME ON STUDYING IN SMALL GROUPS.

Course name	Time on self-learning in the education plan (normative), hours	Actual time on self-learning in small groups, hours
1.Pedagogy	72	98
2. Psychology	72	101

Also, during the experiment, teachers and students were repeatedly surveyed to identify their attitude to learning in small groups, shortcomings and suggestions for improving learning. Students were asked questions to assess their satisfaction with training and qualifications of teachers. According to the results of the survey, the constant modernization was carried out.

The teachers analyzed the communication of students on forums and in chats, as well as during teleconferences with their participation. Of particular interest were cases of mentoring support of untrained students by their more successful groupmates. As it turned out, the mentoring activity of students was not due to the quantitative composition of the groups but the qualitative composition. In small groups with a significant difference in training of their participants, mentoring situations were observed more often.

V. DISCUSSION OF RESULTS

Experimental training for meeting pedagogical tasks showed that using of the considered training technology based on e-learning methods, training in small groups and project training allowed to solve the problem of different initial level of training of students through activation of mentoring, involving untrained students in the implementation of project tasks.

We determined the optimal compositions and the corresponding complexity of tasks and pedagogical situations. Positive dynamics of increasing the time of self-learning of students were also shown.

Students’ competencies of studying in a small group, competence of professional communication, mentoring competence along with professional competencies to cope with pedagogical tasks were formed. "Strong" students actively helped the "weak" students, and they, in turn, felt confident in their own abilities, mastered new activities, participated in discussions and defended their own point of view.

VI. CONCLUSION

Thus, the objectives were met: it was confirmed that the use of e-learning methods based on LMS Moodle jointly with the organization of self-learning of students in small groups in figuring out pedagogical tasks increased the effectiveness of training of future teachers, increased the time of self-learning of students and increased its quality, stimulated mentoring of "strong" students over "weak", providing a solution to the problem of different initial level of training of students. It was also determined the optimal number of students for the organization of small groups of courses and the complexity of tasks for self-learning.

The proposed technology of training and results can be reproduced in training of teachers at different educational institutions.

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