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Analysis of the effectiveness of group tasks in e-learning of future teachers

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Abstract

This paper describes an experimental training course for future teachers using e-learning and students' independent work in small groups via an educational technology based on the following approaches: e-learning, small group learning, and project-based learning. As a result, the proposed educational technique increases students' involvement in independent learning activities and improves their quality, stimulating better prepared students to mentor the less prepared ones. In conclusion, the experiment described in this paper was aimed to confirm the assumption that the use of e-learning methods, combined with organizing students' independent work in small groups, could increase the effectiveness of training future teachers.

Keywords: e-learning, information technologies, small group.

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Análisis de la efectividad de las tareas grupales en e-learning de futuros docentes

Resumen

Este documento describe un curso de capacitación experimental para futuros maestros que utilizan el aprendizaje electrónico y el trabajo independiente de los alumnos en grupos pequeños a través de una tecnología educativa basada en los siguientes enfoques: aprendizaje electrónico, aprendizaje en grupos pequeños y aprendizaje basado en proyectos. Como resultado, la técnica educativa propuesta aumenta la participación de los estudiantes en actividades de aprendizaje independiente y mejora su calidad, estimulando a los estudiantes mejor preparados para guiar a los menos preparados. En conclusión, el experimento descrito en este documento tenía como objetivo confirmar el supuesto de que el uso de métodos de aprendizaje electrónico, combinado con la organización del trabajo independiente de los alumnos en pequeños grupos, podría aumentar la eficacia de la capacitación de futuros maestros.

Palabras clave: formación a distancia, tecnologías informáticas, grupo pequeño.

1. INTRODUCTION

The Novokuznetsk Branch of the Kemerovo State University has been training teachers since 1939. Over this time, more than 50 thousand teachers in various subjects have been trained to provide for the staffing needs of the region's schools. Training in the university branch is conducted at 10 faculties and 26 degree-granting departments. The students are currently enrolled in the programs leading to bachelor's degrees with one or two areas of specialization

and the standard periods of study of 4 and 5 years respectively. The list of educational programs includes specializations corresponding to all school subjects, as well as training in primary and pre-school education, pedagogical psychology, defectology and vocational education. The Department of Theory and Methods of Teaching Informatics grants degrees in the following disciplines: Informatics, Informatics and English, Mathematics and Informatics, Physics and Informatics, Technology and Informatics. The members of the department academic staff also teach IT disciplines to the students of other teacher training departments. In 2004 the higher education institution launched the teacher training programs of multilevel education, and at the same time, there was a change in state educational standards, with a transition from the formation of knowledge to the formation of competencies needed in professional activities. That resulted in significant changes in the educational process and required modernization of educational programs and the introduction of new training content, forms and methods. In the process of changes, the following problems emerged in the teacher training:

1) the levels of students' prior preparation varied from advanced (students have some experience of academic work; they have basic knowledge and skills in the studied disciplines and can plan their own processes and pursue their professional development independently) to insufficient (students have a low basic level in the studied disciplines, have no experience of

academic work and cannot plan their own professional development);

2) Lack of pedagogical tools for the formation of mentoring and teamwork skills in the process of students' mastering the major disciplines of the educational program;

3) Lack of effective forms of organizing students' independent work within the frameworks of mastering major disciplines of the educational program; insufficient motivation of students for independent work and performance of tasks, etc.

Moreover, the modern scientific and technological progress and the development of information and communication technologies resulted in contradictions between students' demands and the opportunities provided by higher education institutions. For example, some scholars emphasize that traditional higher education has a number of negative features associated with the position of the academic staff (Edwards, 1993):

– They perform their lectures instead of organizing joint training activities;

– They are keen on presenting their own knowledge; therefore they speak too much without stimulating dialogue with students;

– The learning process does not stimulate dialogue between students, as they are not motivated to debate and the instructor does not have time to communicate with each student;

– The situations when students do not prepare for classes and wait for explanations from the instructor instead of working with information sources occur more and more often;

– Situations occur in which one student dominates or blocks the discussion;

– Students often ask for a ready solution to the problem rather than look for it.

In order to solve the problems, eliminate contradictions and deficiencies of teacher training and to meet the requirements for the effective use of material resources and the academic load, the degree-granting department decided to use e-learning methods based on the Moodle learning management system (LMS) and to organize students' independent work in small groups.

We set the following objectives:

1) to confirm the assumption that the use of e-learning methods based on the Moodle LMS, combined with organizing students' independent work in small groups, can help in to achieve the following:

– To increase the effectiveness of training future teachers;

– To develop students' involvement in independent learning activities and improve their quality,

– To stimulate strong students' mentoring of the weaker ones, which would contribute to solving the problem of differences in levels of students' prior preparation;

2) To determine the optimal number of students for organizing small groups and the complexity of tasks for their independent work.

The educational technology developed and implemented to meet these objectives is based on the use of e-learning methods in the Moodle LMS environment, combined with an organisation of students' independent work in small groups.

2. METHODOLOGY

To achieve the research objectives, we developed an educational technology based on the following approaches: e-learning, small group learning, and project-based learning. It should be noted that the organization of in-class instruction did not change and remained traditional: students attended lectures and seminars and, if necessary, performed laboratory tasks and asked for instructions. The changes

were introduced only into the organization of students' independent work as an important component of the curriculum with the set time limits. The educational programs provide for 50/50 time allocation between in-class instruction and independent work. The use of Moodle LMS also became an important pre-condition for the considered educational technology. Modern learning management systems contain sets of tools for designing and organizing the educational process, including the following:

1) Systems for webinars, chats and forums;

2) Tools for developing and cataloguing the educational content – e.g., e-textbooks for independent learning and links to electronic libraries with educational materials and methodological guidelines;

3) Education quality assessment systems, including the system of tests;

4) Tools for the modular training based on the system of organization and management of the educational process.

E-learning is a new model of the educational process, which is based on the infrastructure providing basic and additional services, an organization of the user base, integration with external databases and set of rights and roles for the participants in the learning process (Anderson and Elloumi, 2004). The educational content of the e-

learning systems supporting the educational process consists of interactive tutorials, webinars and video conferences. Moreover, e-learning platforms allow analysing and storing learning results, maintaining student portfolios, and generating reports. Our review of e-learning possibilities makes no pretence of being exhaustive (besides, the list of them has expanded annually with the software market development), but it can be a basis for choosing a web-platform. Moodle LMS is one of such platforms. Moodle is an integrated environment characterized by modularity and support for open protocols. Its main advantage is the support for all types of learning activities. Scholarly publications have repeatedly described the application of Moodle for the implementation of research on online learning strategies (Deng and Hemphill, 2006).

Technical support of the learning management system was provided by the data processing centre, including laboratories for system administration and maintenance of web-sites, development, implementation and maintenance of software and testing support, and a technical training and broadcasting department. The centre has 54 employees. The main equipment used in the educational process included: 26 computer laboratories, 54 multimedia auditoriums, 7 conference halls, and 15 servers with more than 200 TB of disk space. The learning process was organized so that students could master the disciplines of the curriculum and perform tasks for independent work in the Moodle LMS environment. The instructors offered tasks for independent work, provided consulting support and conducted intermediate and final assessment of students' knowledge of the studied

disciplines. When preparing the tasks, we used various elements of the electronic courses offered by the system: lectures, four forms of tasks (one or several files as a response, an answer on the page and an oral answer), testing, polling, questioning, compiling a glossary and wiki.

The main distinctive feature of our educational technology was the training of future teachers in small groups, in which students performed tasks, developing their independent learning skills and interacting with other group members with the use of information and communication technologies: teleconferencing, chats and forums, e-mails and social networks. It is traditionally considered Kadel and Keenher (1994) that the small group learning places more pressure on resources of the educational institution (auditoriums, instructors, library, laboratories, etc.), but in the described case, when we use the Moodle learning management system and means of online communication (Skype) for the group work, the required resource allocation is considerably decreased. Some scholars mention that work in small groups stimulates students to demonstrate independent activity in obtaining new knowledge, so the educational process is shifting from instruction to learning and gaining knowledge (Harris and Watson, 1997). In scholars' opinion, the following characteristics differentiate learning in small groups from traditional learning in large groups (Goodsell et al., 1992):

– The orientation of students to the solution of applied tasks;

– Constant dialogue (discussions) between group members;

– Opportunities for students to demonstrate their mentoring skills;

– More accurate feedback in the learning process;

– Reflection on problem solving at each step;

– Development of students' teamwork skills;

– Planning of students' personal development;

– Involvement of some group members by others into the teamwork.

Such opportunities provided by the group work are most relevant for the training of future teachers, since in the process, along with mastering academic disciplines, they develop the most important competencies for their future pedagogical activities. Felder and Brent (2001) describe the role of instructors in the small-group learning process: they actively participate in the work of small groups and ensure implementation of the curriculum and the educational standard by selecting appropriate teaching methods, creating a comfortable learning environment and assessing the results achieved by the small groups and individual students. Instructors have an opportunity to assess and regulate the three most important teaching processes simultaneously: group management, management of students' activities, and management of students' learning process. Given the key role of the university instructors in the organization of experimental learning in small groups, the following

basic requirements for their personal and professional qualities were formulated:

– An expressed desire to participate in the project;

– Ability to structure the content of training, plan classes and organize students' work;

– Practical knowledge of the methods of content analysis and synthesis of scientific knowledge;

– Ability to establish personal contact with students;

– Understanding the learning process, practical knowledge of the didactic methods and the methodology of teaching the discipline;

– Learning management skills;

– High ratings among students and colleagues;

– A wide range of tools for organizing the educational process and assessing the achievements of students.

It is well known that theoretical basis for cooperative learning was laid in the works by Jean Piaget and Lev Vygotsky. In the second half of the 20th century, the ideas of cooperative learning were implemented in practice, and the approach based on them is known as a method of teaching in small groups. The first works on small group learning reflected

a new perception of education as personal development rather than a way of transferring and obtaining knowledge. The new approach to education was developed in the works by such scholars as Bruffee (1993), Goodsell et al. (1992). Later, the effectiveness of learning in small groups was proven for in-class activities Kadel and Keehner (1994) and for small problem-solving groups (Light, 1990). The methods of active learning were developing along with the practical development of small group learning (Bonwell and Eison, 1991). It became clear that students' belief in their own development and opportunities was growing during problem-solving sessions in small groups (Astin, 1987; Goodsell et al., 1992).

It was noted that the most important result of small group learning is gaining competencies needed in group activities, when students learn new roles (Goodsell et al., 1992). Scholars also focused their attention on problems of organizing groups and the ability of students to change the group. In particular, the students assigned to permanent groups were involved in the system of group values more successfully than those who changed groups (Goodsell et al., 1992). For effective personal development, students have to move from one type of activity to another (from individual to group work), depending on the tasks related to studying a particular discipline. In Russia, the methodology of small groups learning (cooperative learning method) was described in the works by Dyachenko (1992) and Choshanov (1999a; 1999b),

The latest developments in small group learning are associated with the active introduction of information technologies, development of new software products and websites, allowing not only to generalize experience and existing teaching methods, but also to provide educational content for

studying academic disciplines, to organize working in small groups and to discuss the experience of higher education institutions and individual instructors (Deng and Hemphil, 2006).

2.1. Organization of experimental training

At first, we offered standard educational programs for training teachers of informatics, physics and mathematics. In the process of training, we had an idea of organizing students' work in small groups, which allowed successful students to act as mentors, to teach weaker students and to guide them when performing complex tasks. The training proved to be very effective, but we did not record any statistical data to confirm the fact, because at that stage it was most important to work out organizational aspects and to build up a set of tasks of different complexity levels. Later, we decided to conduct an experiment that would allow us to assess the applicability of the developed educational technology more accurately and to confirm its effectiveness. For that purpose, we had to do the following:

– To compile a list of educational programs for teacher training to be included in the experiment;

– To select academic disciplines for group training;

– To determine the most effective complexity of tasks for each discipline;

– To establish the size of small groups to maximize training effectiveness.

When choosing educational programs for the experimental teacher training, we took the following factors into consideration:

– Representation of different specializations, both in natural sciences and the humanities;

– The personal interest of instructors and students in participating in experimental training;

– Problems connected with varying levels of students' prior preparation in the considered specializations.

Based on the expert assessment, eight educational programs were chosen out of 24 (Table 1).

Teacher training specialisations of educational programs	Number of students	Number of groups
1. Mathematics	64	4
2. Informatics	56	4
3. Physics	24	3
4. History	75	4
5. Geography	46	2
6. Biology	47	2
7. Primary Education	40	2
8. Pre-school Education	61	3

Table 1. Educational programs chosen for experimental training

When selecting academic disciplines, we primarily took into account the existing educational practice of the university and the availability of comprehensive tasks and projects for studying a particular discipline. After all, one of the pre-conditions for small group learning is the use of project-based tasks. In addition, for the confirmation of the effectiveness of our experimental educational technology, we had to select a wide range of disciplines related to different branches of scientific knowledge in all sections of the teacher training educational programs offered by the university. An expert assessment was conducted for all disciplines of the curricula, and nine academic disciplines were chosen for our experiment out of 145 (Table 2).

Discipline	Discipline load in credit units (hours)	Number of semesters for discipline study	Final reporting forms
1. Information Technologies in Education	3 (108)	2	Examination
2. Concepts of Modern Natural Sciences	2 (72)	1	Test
3. Pedagogical Rhetoric	2 (72)	1	Test
4. Philosophy	2 (72)	1	Test
5. History	2 (72)	1	Test
6. Pedagogy	4 (144)	2	Examination
7. Psychology	4 (144)	2	Examination
8. Information Management	2 (72)	1	Test
9. Special Pedagogy and Psychology	4 (144)	2	Examination

Table 2. Academic disciplines chosen for experimental training

The experimental training lasted for three years. 18 instructors and 413 students took part in the training during this period. The initial size of small groups was determined on the basis of data on teaching medical students (McCrorie, 2006). Taking into account the specifics of teacher training, we determined the following sizes for the small

groups to be used in our work: three, five and ten persons. Table 3 summarises the main characteristics we used in small group learning. These characteristics were taken from the works by various authors and revised to reflect the specific features of our educational programs and the university traditions. The use of such characteristics during formation of groups by various instructors allowed us to achieve reproducible results(Mirasova,2018).

Small group characteristics	Characteristic description in experimental training context
1. Time	Coincides with the discipline study period (from 1 to 6 semesters).
2. Physical environment	Training is organised in the technology-enhanced learning environment. Small-group learning environment is formed with Moodle LMS tools. The learning management system integrates all the information about the studied discipline, information sources, tasks for students' independent work, components of the assessment of learning results for a particular discipline, and a forum and a chat for communication between the group members and their instructor. Moreover, the technology-enhanced learning environment includes an electronic catalogue of the library and online access to federal electronic library systems, as well as collections of digital educational materials. An additional means of electronic communication is the teleconferencing system. Students work in computer labs with multimedia equipment and marker boards. Special laboratory equipment can be used, depending on the discipline learning tasks.
3. Group size	Three, five, and ten persons
4. Group composition	Groups are formed based on the principle of cooperation between students with different initial levels of knowledge. Any group, as a rule, includes both weaker students and the students with a better prior preparation. Such group composition should stimulate mentoring. The predominance of strong students can result in the exclusion of weaker ones from the joint work, and the predominance of weak students leads to a poor performance when solving the learning tasks.
5. Communication between group members	The main means of communication are chat, forum and teleconferencing. Communications by phone, text messages and direct communication between team members are also

	used in the group work.
6. Participation of group members	Participation of all group members is ensured through complex tasks, individual reports of group members, the position of the informal group leader, the pattern of interaction in the group, competitive environment within the group and competition between groups. The degree of involvement of all students in the work of small groups is controlled by the instructors teaching the studied disciplines.
7. Group cohesiveness	Cohesion is associated with the formation of team spirit. Understanding of common goals and the role of each team member in achieving the goal. Mentoring, mutual assistance and informal relations.
8. Group work norms	The norms are formed in the process of work under instructor's supervision. They are determined by the university culture of students' academic activities, which is formed at all training stages. The most important requirement is to fulfil the assigned and accepted individual tasks. In some cases, the group has an active leader, who is the guarantor of compliance with the group work standards. The group can adopt norms in the form of a declaration. For example, typical rules for groups can be formulated as follows: 1. All decisions should be made on the basis of consensus. 2. Any group member can apply to the group for additional time to complete the task or to clarify additional details of the working conditions. 3. Group work begins and ends at the specified time. 4. Part of the working time is allocated to informal communication between group members. 5. At the end of a working period, the group analyses the plan implementation.
9. Procedures	Students perform standard procedures of educational activities: search for materials, subject area analysis, synthesis of new ideas, calculations, description of the work, etc.
10. Group structure	Already at the first meeting of the group members, they begin to distribute roles, and the group leader appears. They distribute tasks, and it becomes clear to which extent each group member is ready to solve the assigned tasks. In each group there is informal communication, and sub-groups appear. The group structure becomes clear after discussion of the following: planning, division of the workload, responsibilities in the group, and areas of responsibility.
11. Aims	Group aims are defined by the group members. The aim of the group is related to the solution of the assigned task, personal development of each group member and formation of professional competencies and teamwork skills.
12. Tasks	Group tasks are formulated as disclosure of the group's aim. Tasks result from decomposition of the aim and are

	personal in nature. The most convenient option: one group member is responsible for solving the task. The tasks are discussed and approved at the general meeting of the group. The group should be encouraged to include the tasks related to the group members' training and mentoring.
13. Group climate	The climate in the group depends on a number of parameters: the group leader position, involvement of all group members, norms elaboration, absence of personal conflicts and psychological compatibility of the group members; in some cases it is advisable to change the group composition to ensure a positive climate and working relationships.

Table 3. Characteristics of small groups for organisation of training

The materials on academic disciplines and tasks for independent work were prepared to take into account the requirements of the state educational standard, curriculum and the programs of the studied disciplines. When organizing the training, we used non-linear methods of forming the educational content (descriptive, conceptual, cognitive, relational, networking, hierarchical, frame-based, infological methods and textological relationships between entities) and a method of the hypertextual structuring of the educational content presented as a sequence of procedures:

– Problem identification;

– Search for educational materials;

– Information extraction from primary sources;

– Knowledge structuring;

– Hypertext implementation.

The instructors used the method of cognitive modelling of pedagogical situations Mozharov (1999) and well-known interactive teaching methods (method of heuristic forecasting, nominal group technique, brainstorming method, methods of extrapolation and analogies, methods of organizational modelling, Delphi method, synectics method, etc.). During the academic year, the instructors structured the educational content for each discipline and prepared practice-oriented tasks differentiated according to the complexity level. The complexity ranking was based on the time spent by one student to perform the task. For example, they prepared the following content for Information Technologies in Education (a new discipline recently introduced into the teacher training educational programs): learning materials, tasks for laboratory work, intermediate tests and cases for projects to be presented and defended at the degree-granting department. Students were encouraged to use the OpenProject project management software and the SCIM administration platform. In laboratory works, the students were offered multi-level assignments to design information systems for supporting various processes.

3. RESULTS

During the experimental training, we received a large array of statistical data, part of which has been processed. The collection of data was facilitated by the application of recording functions of the used computer programs. The data were collected and classified into different

categories based on their characteristics, depending on the initial objectives of the experimental training. At present, many components of the used educational technology have already been improved and applied in educational practice, and new arrays of statistical data are being accumulated. In this paper, we present only the results of training for 2015–2017. The integrated assessment of small group learning shows an increase in the effectiveness of training in small groups compared to traditional training methods (Table 4). The integrated assessment was calculated on a five-point grading scale, based on the additive convolution of current grades in the studied academic discipline, grades in assessment tests, and midterm and final exam grades in the studied discipline. This method proved to be reliable for assessing effectiveness even in cases when the final exam was graded by external experts (representatives of future employers).

Teacher training specialisations of educational programs	Number of students	Assessment of training effectiveness on a five-point grading scale in control groups (integrated assessment for all tests and exams)	Assessment of training effectiveness on a five-point grading scale in experimental groups (integrated assessment for all tests and exams)
1. Mathematics	64	3.473	3.711
2. Informatics	56	3.077	4.132
3. Physics	24	3.129	4.221
4. History	75	3.030	4.247
5. Geography	46	3.542	4.166
6. Biology	47	3.298	4.273
7. Primary Education	40	4.130	4.775
8. Pre-school Education	61	4.296	4.732

Table 4. Comparing training effectiveness in traditional learning and in small groups by specialisations of teacher training educational programs

One of the experimental training objectives was to determine the optimal group size for the studied disciplines. One of the initial assumptions was that there should be some correlation between the content of the studied academic disciplines, the optimal size of groups and the complexity of tasks offered to students. Indeed, we can observe, even in humanitarian and technical disciplines, the prevalence of tasks requiring either collective or individual work. For example, mathematical problems require a high level of concentration and individual efforts, but in physics, which is rather close in content, there are many applied tasks that can be easily decomposed, so they can be more effectively solved in groups. The experimental training confirmed our assumption. In a number of cases, it turned out that individual work on learning tasks was rather effective. However, even in those cases, we could confirm the overall effectiveness of small group learning. As a result, we determined the optimal correlation between the group size and the complexity of tasks for specific disciplines (Table 5).

Discipline	Optimal size of small groups 1 person (traditional training), 3, 5, 10 persons	Optimal complexity of tasks Levels 1, 2, 3, 4
1. Information Technologies in Education		
– the best result	3	2
– the second best result	1	2
2. Concepts of Modern Natural Sciences		
– the best result	3	2
– the second best result	3	3
3. Pedagogical Rhetoric		
– the best result	10	4
– the second best result	5	4
4. Philosophy		
– the best result	1	3
– the second best result	3	3

5. History		
– the best result	5	4
– the second best result	10	4
6. Pedagogy		
– the best result	3	4
– the second best result	5	3
7. Psychology		
– the best result	5	4
– the second best result	5	3
8. Information Management		
– the best result	10	4
– the second best result	5	4
9. Special Pedagogy and Psychology		
– the best result	3	3
– the second best result	1	2

Table 5. Optimal size of small groups and complexity of tasks for specific disciplines in small group learning

A very important result was obtained during the analysis of the time spent on independent work by students in small groups in comparison with the regulative requirements of the educational standard (Table 6). With the traditional approach, the instructors often noted the lack of students' motivation to study the academic disciplines independently and complained that students came to class unprepared, did not fulfil their tasks, and so on. Learning in small groups showed that the actual time spent by students for independent work considerably increased.

Discipline	Time allocated for independent work (normative), hours	Actual time spent for independent work in small groups, hours
1. Information Technologies in Education	36	43
2. Concepts of Modern Natural Sciences	36	32
3. Pedagogical Rhetoric	36	41
4. Philosophy	72	104
5. History	36	71
6. Pedagogy	72	98
7. Psychology	72	101
8. Information Management	36	43
9. Special Pedagogy and Psychology	72	93

Table 6. Comparison between normative times allocated for students' independent work and actually spent time in small groups for each discipline

Moreover, it was established that students allocated less time for independent work when they performed it individually as compared with working in small groups. We did not find any direct correlation between the time spent on independent work and the group size (Table 7). We observed the dependence of the time spent on independent work on the specializations of educational programs. For example, more time was spent on independent work by future primary school teachers and future pre-school teachers. However, as shown by a deeper analysis, that dependence was related to differences in levels of students' prior preparation, varying between the specializations.

Teacher training specialisations of educational programs	Time actually spent for independent work in different small groups as a fraction of normative time			
	1 person (traditional form)	3 persons	5 persons	10 persons
1. Mathematics	0.732	0.943	1.122	1.236
2. Informatics	0.892	1.002	1.209	1.197
3. Physics	0.921	1.341	1.379	1.300
4. History	0.745	0.925	0.978	1.102
5. Geography	0.794	1.002	0.934	0.992
6. Biology	0.776	0.956	1.210	1.237
7. Primary Education	1.211	1.245	1.314	1.339
8. Pre-school Education	1.199	1.349	1.308	1.401

Table 7. Comparison of time actually spent for independent work in groups of different size for each specialisation of educational programs

During the period of experimental training, we repeatedly conducted questionnaire surveys among instructors and students to identify their attitudes toward small group learning, shortcomings of this approach and their suggestions for improving the training process. Students were asked questions to assess their satisfaction with the training and instructors' qualification. Based on the survey results, the training process was constantly improved. The university instructors analyzed communication between students at forums and in chat rooms, as well as during teleconferences in which they participated. Of particular interest were cases of mentoring support for weaker students by their more successful classmates. As we found out, the occurrence of students' mentoring did not depend on the group size, is mostly related to the group qualitative composition. Mentoring occurred more often in small groups with considerable differences in students' prior preparation.

4. DISCUSSION

The results of experimental training prove that the considered educational technology, based on e-learning methods, small groups and project-based learning, allows solving the problem of varying levels of students' prior preparation by promoting mentoring and involving weaker students in the performance of project assignments. We determined the optimal sizes of small groups and the corresponding complexity of tasks for specific disciplines and observed positive dynamics in the time spent by students for independent work. Along with mastering their academic disciplines, the students gained competencies needed for the small group work, professional competencies and mentoring skills. Strong students actively helped the weaker students, who developed confidence in their own abilities, mastered new activities, participated in discussions and defended their own points of view.

Thus, the experiment objectives were achieved: we confirmed that the use of e-learning methods based on the Moodle LMS combined with organizing students' independent work in small groups produced the following results: the effectiveness of training future teachers increased; students dedicated more time to independent learning activities, and their quality improved; strong students' mentoring of the weaker ones was stimulated, which contributed to solving the problem of differences in levels of students' prior preparation; We also determined the optimal number of students for organizing small groups and the complexity of tasks for their

independent work. The educational technology used in the experiment and the achieved results can be reproduced for teacher training in other higher education institutions.

5. CONCLUSION

The issues addressed in the paper are of particular relevance due to the need of modernising the process of teacher training and new requirements for the organization and content of students' independent work in the context of the competency-based approach, as well as the need to organize mentoring in student groups to address the problem of varying levels of students' prior preparation. Therefore, the experiment described in this paper was aimed to confirm the assumption that the use of e-learning methods, combined with organizing students' independent work in small groups, could increase the effectiveness of training future teachers, develop students' involvement in independent learning activities and improve their quality, and stimulate strong students' mentoring of the weaker ones, which would contribute to solving the problem of differences in levels of students' prior preparation. The primary method used to address the topic was the use of e-learning methods based on the Moodle LMS, combined with organizing students' independent work in small groups. As a result, the initial assumptions were confirmed, the effectiveness of the educational technology was proven, the optimal group size and the complexity of tasks for specific disciplines were determined. The materials presented in this paper may be useful for the administrative

and academic staff of pedagogical schools of higher education and for teacher training scholars and can allow reproducing the achieved results in the educational practice of other higher education institutions.

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