

Cluster Model of Multilingual Training of University Students: Theory and Practice of Engineering Education

Svetlana Suvorova¹, Tatyana Khilchenko², Elena Gnatyshina³, Natalia Uvarina¹ and Alexey Savchenkov¹

¹Shadrinsk State Pedagogical University, Shadrinsk, Russia

²St. Petersburg Academy of In-Service Pedagogical Education, Shadrinsk, Russia

³South Ural State Humanitarian Pedagogical University, Chelyabinsk, Russia

Summary

Nowadays clusters are recognized as an important instrument for promoting industrial development, innovation, competitiveness and growth. An educational cluster is a set of interrelated vocational educational institutions of various levels that are united by industry with each other and are connected by partnership with industry enterprises. This article attempts to develop and describe cluster model of university students' multilingual training. The purpose of this study is to describe multilingual training of university students and their polycultural competencies formation and to define the process of multilingual training in form of a cluster. The authors consider clusters as an integral part of the educational campus within the concept framework of Shadrinsk State Pedagogical University. To determine the essence of the concept of a cluster model of university students' multilingual training, theoretical, empirical, observational, and diagnostic methods were implemented, such as a review of scientific literature, a compilation of best practices, observation, statistical methods, etc. The authors analyzed the programs of partner universities and organized international webinars and internships for bachelors and masters abroad and developed online courses "Foreign language for undergraduate students and masters". Experimental data obtained during the implementation of cluster training show the effectiveness of the formation of students' polycultural competencies.

Keywords:

polycultural competencies, vocational education, foreign language.

1. Introduction

The purpose of the paper is to analyze the cluster models of the European universities and to present a cluster model of multilingual training of Shadrinsk state pedagogical university students. The authors developed online courses "Foreign language for undergraduate students and masters" (<https://eos.shspu.ru/>) on the platform of MOODLE learning environment which can be easily integrated into classroom activities. The purpose of the courses is to implement such effective learning methods as intensive practice through tasks, real-life lesson models and situations, cross-cultural interaction training, research projects, group discussions, interactive tasks for the development of students' polycultural competencies. The

developed courses were successfully implemented in the educational process. The results of placement and final tests show a significant improvement in the development of students' professional competencies.

In the process of modeling the educational cluster, the possibilities of partner universities were taken into account: Kostanay State Pedagogical University, Russian-German Meeting Center (St. Petersburg), Finnish language school Lärkkulla Foundation Folk Academy, where students can be trained due to academic mobility.

Any scientific hypothesis is aimed at experimental checking of the validity of the considered aspects. Consequently, our research hypothesis runs as follows: modeling multilingual training of university students in form of a cluster will result in intensifying the educational process in the university.

Having put forward the problem and hypothesis of the research, it is necessary to differentiate the purposes of university students' multilingual training and the meaning of their polycultural competences. Purposes of multilingual training of university students can be as follows. Multicultural character of education includes the following components: education for citizenship and willingness to actively participate in society, promote the continued development of society, democracy, understanding, conservation, learning the local, international and historic cultures in the context of cultural pluralism, education ability to protect and enhance social values laying the foundation of a democratic society, the development and improvement of education at all levels, including teacher training, improving their skills. For the concept of multiculturalism national education means functioning of an educational environment of linguistic, cultural, multi-ethnic and spiritual diversity [1,2].

The cluster is called: 1) a set of interrelated institutions of vocational education, united by industry sign and partnerships with the industry; 2) the system of training, mutual learning and self-learning tools in the innovation chain "science – technology – business ", based primarily on horizontal links within the chain. Modeling the educational cluster for the process of university students' multilingual training involves the creation of a process and

competency model taking into account the students' training in a Russian university and a partner university. Educational clusters and new technologies in multicultural education highlight the importance of generating qualified human resources. Their contribution to the creation of outcomes-based competence profiles is the subject of research of both Russian and foreign scientists such as S.S. Espaev [3], G. McAllister, J.J. Irwing [4], A.V. Torkhova [5] and others.

Based on specific characteristics of economic clusters defined by Porter A. Makulova, G. Alimzhanova, Z. Bekturganova, Z. Umirzakova, L. Makulova, K. Karymbayeva [6] study the competence based approach in education and define the model of professional competence. The competence model of a graduate must guarantee getting a qualification corresponding to his future career. It is expected that competencies acquired by the student in high school, will manifest themselves in different everyday life and professional situations.

The model of educational cluster developed by the scientist E.I. Sokolova [7] is of great importance for our research. The essence of the concept of educational clusters is to unite the leading industrial university institutions and primary and secondary vocational educational institutions, specialized schools, basic enterprises, main customers and consumer specialists.

Modeling polycultural competence clusters (PCC) is based on research carried out by A. Galante [8], J. Diller, J. Moule [9], D.W. Sue, P. Arrendondo, R.J. McDavis [10]. Based on the above mentioned research the essence of the concept "polycultural competence of the personality" can be defined as polycultural tolerance and sociocultural identity. An educational cluster is a set of vocational educational institutions linked by partnerships with groups of enterprises united by industry.

A cluster model is a cluster schematic diagram that record the main stages of the process and its components. University students' multilingual training is a holistic pedagogical system aimed at the formation of a student's personality capable and ready to carry out intercultural communication in various foreign languages. Cluster model of university students' multilingual training is a cluster schematic diagram that record the main stages of the multilingual training process and its components - polycultural competences of students.

Competence is an integrated concept that indicates the ability of the individual to use independently various elements of knowledge, skills and attitudes in everyday and new situations [11,12]. Polycultural competence is considered as the combination of cultural tolerance and sociocultural identity. Polycultural competence is also viewed as an integrative quality that is reflected in a person's awareness of the content and means of interaction with the polycultural world and realized in a person's ability to function in a polycultural world [13].

A cluster of multilingual training of university students and their polycultural competencies as a planned result is currently being formed under the influence of inter-action, though formalized, appropriate structures and labor market segments [14].

The problem has been studied in the following way - this study is aimed at de-scribing multilingual training of university students and their polycultural competencies and defining the process of multilingual training in form of a cluster.

2. Materials and Methods

We can list some key points and strategies that should be the basis of the university students' multilingual training and the formation of their polycultural competences:

"Lifelong learning". This approach presupposes the creation of conditions for formation of the competences at the university and then in the profession.

Student-centered approach. This approach means taking into account the priority of interests, desires, motivations of students to participate in educational programs.

Practice-oriented approach (work-based learning). This approach means the development of the scientific and innovative potential of students and the formation of their linguistic and cultural competences.

The approach of "open education". This approach is aimed at providing open access for students to recognized foreign knowledge centers.

The following scientific methods were used while carrying out the research:

Theoretical methods: a) the analysis of normative documents on education was used to justify the urgency of the problem and determine the legal possibilities for its solution - creating a cluster model of university students' multilingual training; b) the theoretical and methodological analysis allowed to formulate the key initial positions of the research - the position of multilingual training in higher education; c) system analysis was the basis for a holistic review of the problem; d) forecasting and long-term planning were used to identify and analyze the factors that caused the emergence of the problem under study, justification of the possibility of its solution - modeling of a cluster of university students' multilingual training.

Empirical methods: a) generalization and analysis of effective international experience and practice of domestic and foreign higher schools in the creation of clusters of competencies - aimed at creating a cluster model of university students' multilingual training of; b) the focus group method was used to elucidate students' attitudes towards the formation of polycultural competences within the cluster.

Observation methods: observation (direct, indirect) was used to determine the potential of students to participate

in the program of competencies development in foreign languages - to develop online courses "Foreign language for undergraduate students and masters".

Diagnostic methods: questioning, interviewing, conversation, testing, self-assessment, expert assessments were used to determine the level of the formation of students' linguistic, polycultural and professional competencies - for creating a cluster model of university students' multilingual training.

3. Results and Discussion

Cluster model of multilingual training of university students.

We would like to emphasize the stages of the multilingual training process and its components - polycultural competencies of students.

1. goal-setting (joint search for aims – analysis of choice);
2. taking decisions in planning and roles sharing (teacher's role is monitoring or advising – analysis of choice);
3. decomposing the aim and detailing of the stages of multilingual training process (analysis of choice);
4. performing (analysis of actions to be done);
5. monitoring (operational analysis);
6. overall analysis (analysis of the result);
7. feedback, peer reviewing, assessment, grading (meta-analysis of work).

Polycultural competencies contain such competencies as communicative [15], cultural, intercultural, sociocultural and such components as the objectives component, the content component, the operational component and the evaluation-resultative component [16].

Cluster model of university students' multilingual training includes stages of this process, polycultural competences, educational organizations in Russia and abroad, where students can take a course [17-19].

From a practical point of view the possible variants of multilingual training may be the following methods and techniques successfully used in the practice of teaching foreign languages in higher education.

Microteaching is the art of teaching, a complex process, which is not limited to transferring of knowledge from one to another. Microteaching is a special teaching practice model or teaching training method. In this teaching context, there are many actions like the use of methods, the usage of media, learning guide, motivation, classroom management, assessment, analyzing and so on.

The concept of microteaching is mainly based on the following points:

- Teaching in its real form but with a minimum concept.
- The exercise which is designed focuses mostly on the basic teaching skills with the help of feedback based on the knowledge and information of student learning level.

- The teaching is conducted for students who are from different cultural backgrounds.
- Monitoring the micro-teaching exercises conducted in classrooms.
- Enabling the prospective teachers to learn effective teaching skills.
- Helping the students to actively participate in teaching by providing low risk situation.
- It also offers opportunities for retraining at regular time intervals.

Method of group dynamics. Group dynamics deals with the attitudes and behavioral patterns of a group. Group dynamics concern how groups are formed, what is their structure and which processes are followed in their functioning. Thus, it is concerned with the interactions and forces operating between groups. We used the method of group dynamics in the formation of students' language competencies at the Faculty of Humanities.

Methods of training and consulting. Pedagogical consulting is a consultative structuring, related to educational support of developmental learning processes, as well as activities that allow an independent expert evaluation of the effectiveness of the use of teaching technologies.

In our study, pedagogical consulting is positioned as the activity of a teacher (consultant), aimed at assisting the student in finding a solution to his problem situation related to the study of a different language and linguoculture [20].

In the mainstream of our research, we identified three types of pedagogical consulting: problem-oriented, aimed at analyzing the essence and external causes of linguistic intercultural problems, and searching for ways to resolve them; Person-centered, centered on the analysis of individual causes of the problem; decision-oriented, centered on identifying resources to solve identified problems.

In order to encourage elementary students to start speaking and provide them with some thought-provoking material we have developed a Moodle online practice course, some parts of which are used by students outside the classroom, but some exercises are really good additional practice to work in class [21]. The course consists of nine lessons (units) and extra practice activities. Everything that students learn in the online course is discussed in class. The aim of the online course is to provide students with exciting practice material full of clear and meaningful ideas that cannot leave students indifferent and encourage them to speak using their emotions and experience. Thus, we can state that the online course is designed to help students develop their speaking skills that we use to teach students the other skills and explain the material of the lessons [22,23]. This two-way process helps students gain near-native competence in the language step by step.

The formation of polycultural competencies in the learning process and their evaluation greatly facilitates the description of competencies or their clusters in the form of

observable signs of manifestation (descriptors or indicators). Such descriptions are useful for three reasons [24-26]. First, they provide practical guidelines for the work of teachers in the formation of competencies, since they are usually of a pragmatic nature and link the conceptual formulations of competencies with target indicators in the form of real skills to implement practice-oriented and professionally-oriented actions (labor functions) that should be formed by a student. Secondly, these descriptions are necessary for the work of the authors of tasks in the development of funds of competence-oriented assessment tools. Thirdly, they are necessary for experts when assessing the results of students' performance in the competence formation process [27,28]. The practical bases of research were Shadrinsk State Pedagogical University (The Russian Federation – full-time experimental research), Kostanay State Pedagogical University (The Republic of Kazakhstan – full-time experimental research) and Foundation for the Support of Russian-German Relations (Russian-German Meeting Center, drb, St. Petersburg (The Russian Federation – part-time experimental research)).

The aim of the experimental work was to provide interim the summative assessment of level of formation of polycultural competencies of students in control and focus-groups – experimental groups. To answer the question, whether equally the distribution of students into groups takes place according to levels of low, medium and high ones, we used the criterion of "Chi-square" (χ^2) and got the following results in the educational organizations (Tables 1-6).

Table 1. Distribution of students by frequency of cognitive criterion existence in the control and experimental groups

Group	The score in points				The number of people in the group
	0	1	2	3	
CG	7 (2.84)	8 (4.26)	5 (8.33)	5 (9.55)	25
EG-1	5 (2.73)	0 (4.09)	8 (8.00)	11 (9.17)	24
EG-2	0 (2.73)	9 (4.09)	6 (8.00)	9 (9.17)	24
EG-3	1 (2.84)	0 (4.26)	14 (8.33)	10 (9.55)	25
EG-4	1 (2.84)	4 (4.26)	8 (8.33)	12 (9.55)	25
Total	14	21	41	47	123

Table 2. The calculated values of the criterion of "Chi-square" for the indicators of cognitive criterion in the control and experimental groups

Groups	χ^2 r.	χ^2 t.	Hypothesis
CG - EG-1	19.17	7.8	refuted
CG - EG-2	21.93		refuted
CG - EG-3	22.17		refuted
CG - EG-4	14.68		refuted
EG-1-EG-2	15.44		refuted
EG-1-EG-3	15.68		refuted
EG-1-EG-4	8.19		refuted
EG-2-EG-3	18.43		refuted

EG-2-EG-4	10.95		refuted
EG-3-EG-4	11.19		refuted

Consequently, the level of development of polycultural competences on this criterion in the control and experimental groups at the end of the experiment varied.

Table 3. Distribution of students by frequency of existence operational criterion in the control and experimental groups

Group	The score in points				The number of people in the group
	0	1	2	3	
CG	6 (3.25)	5 (2.64)	8 (8.73)	6 (10.36)	25
EG-1	0 (3.12)	4 (2.53)	9 (8.39)	11 (9.95)	24
EG-2	4 (3.12)	0 (2.53)	11 (8.39)	9 (9.95)	24
EG-3	6 (3.25)	0 (2.64)	8 (8.73)	11 (10.36)	25
EG-4	0 (3.25)	4 (2.64)	7 (8.73)	14 (10.36)	25
Total	16	13	43	51	123

Table 4. The calculated values of the criterion of "Chi-square" for indicators operational criterion in the control and experimental groups

Groups	χ^2 r.	χ^2 t.	Hypothesis
CG - EG-1	10.44	7.8	refuted
CG - EG-2	10.01		refuted
CG - EG-3	11.39		refuted
CG - EG-4	11.89		refuted
EG-1-EG-2	7.81		refuted
EG-1-EG-3	9.18		refuted
EG-1-EG-4	9.69		refuted
EG-2-EG-3	8.75		refuted
EG-2-EG-4	9.25		refuted
EG-3-EG-4	10.63		refuted

The level of development of polycultural competences on this criterion in the control and experimental groups at the end of the experiment varied.

Table 5. Distribution of students by frequency of existence the functional criterion in the control and experimental groups

Group	The score in points				The number of people in the group
	0	1	2	3	
CG	6 (3.25)	5 (3.45)	7 (8.94)	7 (9.34)	25
EG-1	5 (3.12)	0 (3.31)	10 (8.58)	9 (8.97)	24
EG-2	0 (3.12)	5 (3.31)	9 (8.58)	10 (8.97)	24
EG-3	1 (3.25)	7 (3.45)	9 (8.94)	8 (9.34)	25
EG-4	4 (3.25)	0 (3.45)	9 (8.94)	12 (9.34)	25
Total	16	17	44	46	123

Table 6. The calculated values of the criterion of "Chi-square" for the functional performance criteria in control and experimental groups

Groups	χ^2 r.	χ^2 t.	Hypothesis
CG - EG-1	8.70	7.8	refuted
CG - EG-2	8.13		refuted
CG - EG-3	9.41		refuted

CG - EG-4	8.40		refuted
EG-1-EG-2	8.79		
EG-1-EG-4	9.05		refuted
EG-1-EG-3	10.07		refuted
EG-2-EG-3	9.50		refuted
EG-2-EG-4	8.49		refuted
EG-3-EG-4	9.77		refuted

The level of development of polycultural competences on this criterion in the control and experimental groups at the end of the experiment varied.

During the formative experiment we also conducted a diagnostic of the assessment / check / monitoring (first assessment check in early formative experiment and the second assessment check – during the formative experiment).

4. Conclusion

To sum up, it is necessary to emphasize the following research findings based on the carried-out experiment:

- (1) Realization of cluster model of university students' multilingual training (when discussing and analyzing hypotheses of the research) resulted in the significant increase in the number of students with high level of formation of polycultural competences on the following criteria: cognitive (10,75% in the first cut to 45%, according to final cut), operational (from 8.5% to 40.5%), functional (from 8.1% to 51.5%).
- (2) The cluster model of university students' multilingual training takes into account all aspects of the formation of their personality: the development of multicultural competences, communicative culture, language competence. The reason for this is the multi-sectoral nature of this training in Russian universities and foreign ones.

Acknowledgments

The study was carried out within the framework of the state task of the Ministry of Education of the Russian Federation on the topic "Monitoring the effectiveness of educational practices in universities to create an educational environment in educational organizations and the development of tools for adapting best practices".

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