International Journal of Environmental & Science Education, 2016, **11**(3), 225-236

The Technology of Teacher Training Contents Projection and Implementation on the Basis of Information Streams Integration

Vera K. Vlasova,
Kazan (Volga region) Federal University, RUSSIA
Alfiya R. Masalimova
Kazan (Volga region) Federal University, RUSSIA
Salamat K. Alamanov
Kyrgyz State University named after I. Arabaev, KYRGYZSTAN

•*Received 16 July 2015* •*Revised 23 September 2015* •*Accepted 29 January 2016*

The article is aimed to develop the technology of teacher training contents projection and implementation on the basis of information streams integration. The leading approach to the development of teacher training contents projection and implementation technology on the basis of information streams integration is the information-logistic approach aimed to provide timeliness and quality of future teachers' competences that make the content of teacher training, their coordinated realization in the educational process, and the demand for them in the innovative manufacturing. The technology of teacher training contents projection and implementation on the basis of information streams integration offers the option of variable logistic trajectories: parallel projection, serial projection and projection through an expressly organized auxiliary link. The developed technology of teacher training contents projection and implementation on the basis of information streams integration realizes basic functions: selection of professionally significant competences for a future teacher, organization of information-environment interactions, the requirements-based teacher training content, the estimation of projection results.

Keywords: teacher training, technology, information streams, integration

INTRODUCTION

The research relevance

The educational practice is characterized by keeping to former stereotypes in regard to teachers' variable professional functions realization that are carried out

Correspondence: Vera K. Vlasova,
Kazan (Volga region) Federal University, 18 Kremlyovskaya Street, 420008, Kazan, RUSSIA
E-mail: v2ko@mail.ru
doi: 10.12973/ijese.2016.306a

ISSN: 1306-3065

without due consideration of modern information specifics of the educational environment. The projection of teacher training content is connected with the solution of such problems as, first, urgent demand for highly professional experts working in the system of education; secondly, the need to realize qualitatively new education of students – future teachers focused on searching of new knowledge, its lifelong replenishment and implementation of professional functions in the information-education environment (Sadovaya, Khakhlova & Reznikov, 2015; Sharifzyanova, Shtreter & Nauryzbayeva, 2015). The information basis of teacher training content projection assumes to consider information streams interrelation and interdependence.

Problems of teacher training content projection and implementation

The designated aspects regarding the existing requirements for the education content, on the one hand, and those realizing their information streams and actual productivity of teacher training, on the other hand, allow to single out some mismatches revealed according to the levels of teacher training content projection and implementation.

The methodological level: increasing requirements to teacher training are insufficiently provided with theoretical provisions when it comes to the compliance of its projection process to the integrative development of information society and innovative manufacturing.

The theoretical level: there has not been substantiated conceptually and revealed structurally the declared aim of teacher training at projecting competences in the context of actual flows of educational information.

The methodical level: teacher training content has no technological basis and does not adequately reveal functions of subjects in the educational process.

The set of stated mismatches between the necessary and actual content of teacher training, becomes evident due to its poor coordination with the required quality of teachers' training, and is the consequence of disorder and weak coordination of information support for its projection and implementation.

Ideas that reveal opportunities and prospects of information streams integration find their place in the problem field of pedagogical science. First of all, these are basic provisions of educational logistics (Denisenko, 2003; Livshits, 2006, etc.), foundations and ways of information and communication technologies application in education (Anisimova & Krasnova, 2015; Golitsyna, 2013; Lavina, 2011; Semushina & Galeeva, 2013, etc.), conditions of creation and realization of information-education environment (Kirilova, 2009; Mukhametzyanov, 2008, etc.), didactic systems of specialists' innovative training in the information sphere (Nureyev, 2009; Ovchinnikova, 2012, etc.; Masalimova & Nigmatov, 2015; Shaidullina et al., 2015), ways to arrange document flow on the basis of information and information streams (Drescher, 2014; Konarzhevsky, etc.).

At the same time, one should state that there are few works revealing the complex of issues concerning modern teacher training content projection and implementation corresponding to the requirements of the labor market, innovative knowledge-intensive manufacturing and new educational standards of experts' quality vocational training in the sphere of education.

MATERIALS AND METHODS

Research objective

The research objective is the development of teacher training content projection and implementation technology on the basis of information streams integration.

Research hypothesis

The implementation of teacher training content will be efficient if its technology integrates information streams of external and internal projection contours and reveals itself in methodically provided selection of a variable logistic trajectory of teacher training content projection and implementation.

Methods of research

In the course of the research there have been applied the following methods: the study of teacher training content projection experience; generalization and systematization of domestic and foreign experience of information interaction in the educational environment of teacher training higher institutions; the stating and forming experiment, questionnaire, an expert assessment, pedagogical observation, interviewing, the monitoring of the teaching process and results, discussion and assessment of diploma and term papers, analytical review of individual and creative reports on tasks, the analysis of students' and teachers' information interaction; the statistical methods: mathematical processing and analysis of the research results.

The research experimental base

The pilot-experimental work was carried out in Kazan (Volga) federal university at the Institute of psychology and education (2011 - 2014).

RESULTS AND DISCUSSIONS

The stages of teacher training content projection and implementation

The stages of teacher training projection and implementation realize the following basic functions on the basis of information streams integration:

– the determination of future teachers' professionally significant competences in the conditions of information society and innovative manufacturing development. Professionally significant competences of the future teacher have projecting specificity; the necessary level of their formation is defined with dynamic priorities of educational process in view;

– the arrangement of information and environmental interactions in the professional education which are considered as the way of vocational education operated development;

– the consideration of requirements for the teacher training content within the priorities of teacher's training in the conditions of information society development and innovative manufacturing. These requirements give the chance to update the teacher training content according to the development of the region;

– the assessment of teacher training content projection results on the basis of information streams integration that assumes the option of a variable projection trajectory.

Trajectories of teacher training content projection on the basis of information streams integration

The technology of teacher training content projection and implementation on the basis of information streams integration is based on three variable projection trajectories: trajectories of parallel projection, serial projection and a projection trajectory through an expressly organized link.

Trajectory of parallel projection

The trajectory of parallel projection is based on the external integration of horizontal information streams and is expressed in the interaction of corresponding divisions in higher educational institutions with the uniform training profile and enterprises that are interested in their future employees; this interaction is based on the use of global information networks and engaging of educational resources of higher educational institutions – developers of educational standards (Figure 1.).

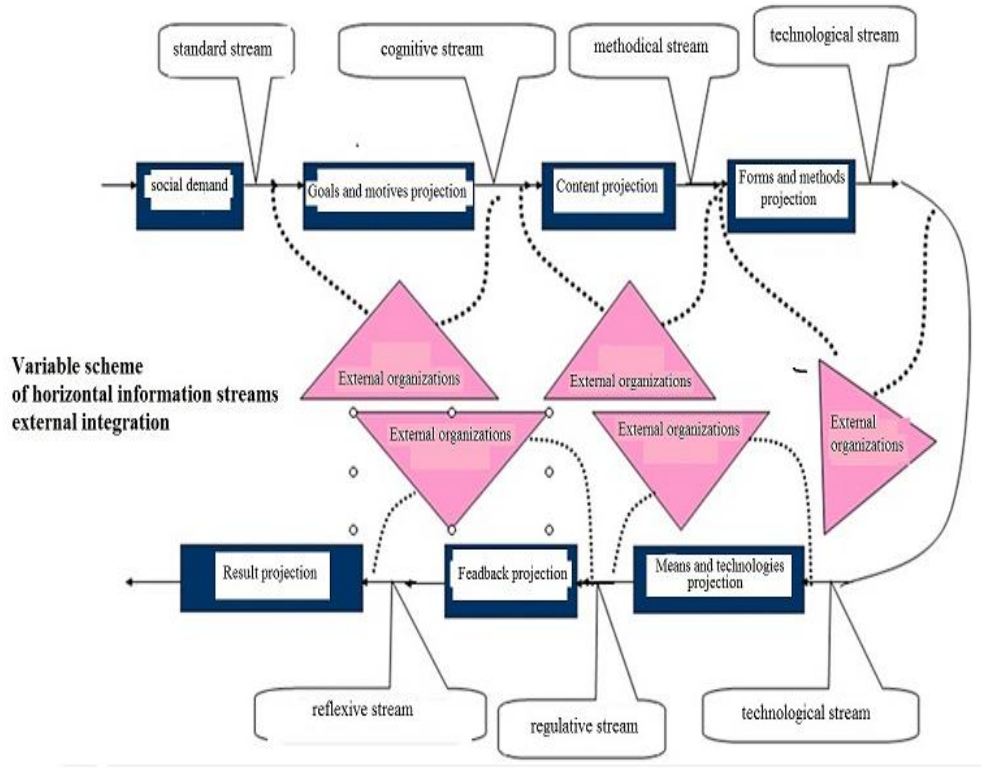


Figure 1. The trajectory of parallel projection based on external integration of horizontal information streams

Trajectory of serial projection

The trajectory of serial projection is based on the internal integration of vertical information streams and is expressed in the use of a local network of a higher education institution. In this case each division itself develops curricula based on the standard only, and provides the contents in full with basic subjects and that part of a vocational training which it is capable to realize within the frames of its opportunities (Figure 2).

Projection trajectory through an expressly organized auxiliary link

The projection trajectory through an expressly organized auxiliary link is based on the integration of information streams of an external and internal contour. This trajectory is bound to the combination of the intellectual potential of a higher education institution around one educational and methodical center capable to become the resource center of information and environment interaction of all divisions in a higher education institution (Figure 3).

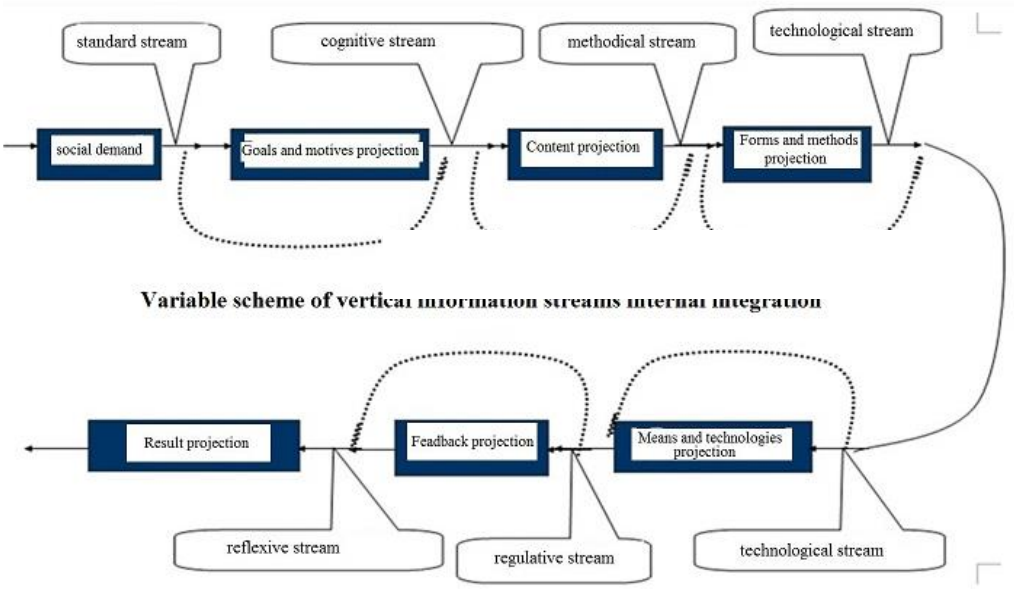


Figure 2. The trajectory of serial projection based on internal integration of vertical information streams

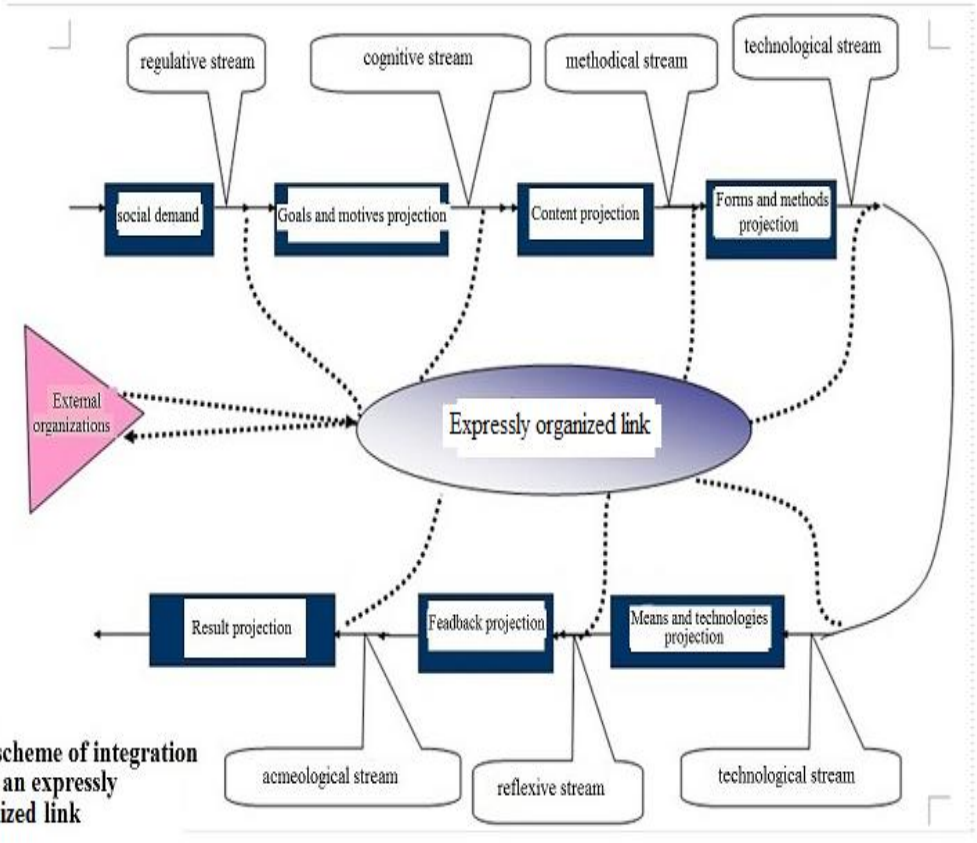


Figure 3. The projection trajectory through an expressly organized auxiliary link

The choice of the specific variable trajectory of projection aimed to implement the teacher training content is defined by the innovative nature of changes in the content of education, and technical and personnel resources that a higher education institution and its partners have.

Experiment course

The pilot study of teacher training content projection and implementation effectiveness on the basis of information streams integration was carried out in three directions.

Teacher training content projection and implementation at the level of the profile training content

The research was conducted in the course of curricula development at the Institute of pedagogics and psychology of KFU in compliance with the new requirements of the federal state educational standards (FSES) for "Pedagogical Education" and "Psychology and Pedagogical Education". This direction shows the interdependence of isolated streams and the choice of the variable projection trajectory aimed to implement teacher training content profile. Teachers are the subjects of interaction at projection. Projecting functions are the definition of projection goals, the content filling of the curriculum.

Content projection and implementation at the level of the academic subject or learning topic

Teachers, students and their future pupils are the subjects of interaction. Projecting functions are supplemented with a variety of role functions performed by students who are, firstly, act as learners, secondly, as designers for their future pupils, and, thirdly, as projectors of their own individual learning trajectory. The student is involved in the process of academic subject content projection, learning theme content projection, and the projection of an individual trajectory within the forecast actualization of the perspective content to master this discipline both for the student and their future pupils; the student also selects the way to implement the contents in the course of individually significant determination of forms, methods and means of implementation. This direction shows the perfection of students' training in regard to education content projection and implementation at the level of an academic subject or a learning topic when they consistently master the roles to project their own educational strategy, its adaptation for future pedagogical activity application, and, finally, self-improvement on the basis of experimental-analytical activity development.

Content projection and implementation at the level of competences content developed in students

This direction shows the perfection of students' training in regard to education content projection and implementation at the level of the mastered competence; it demonstrates the development of the personal motive, students' attitude to their future profession, to obtaining knowledge and experience of pedagogical and projecting activity, and opportunities to improve the environment. Students projecting their own resource act as the subjects of interaction. The projecting functions of subjects are defined by students' role functions.

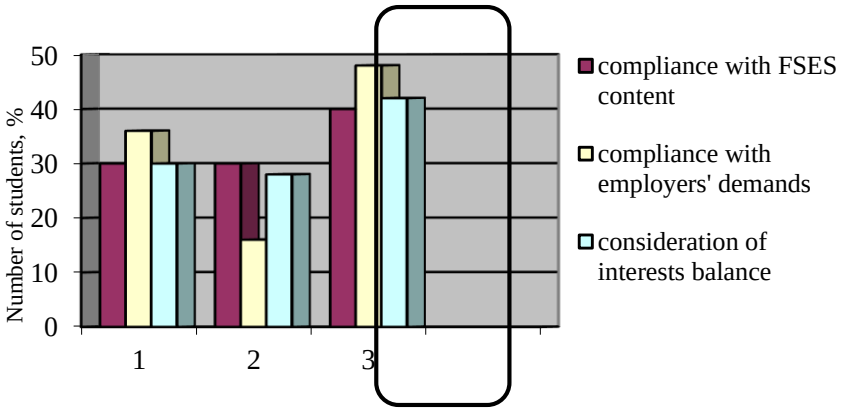
The results of the experiment

Let us show the experimental substantiation of the offered option for variable trajectories (Figure 4, 5 and 6).

The results of the experimental work proved the provision about the determining role of changes innovative nature in the content of education to select the projection efficient trajectory.

At the level of the training profile content

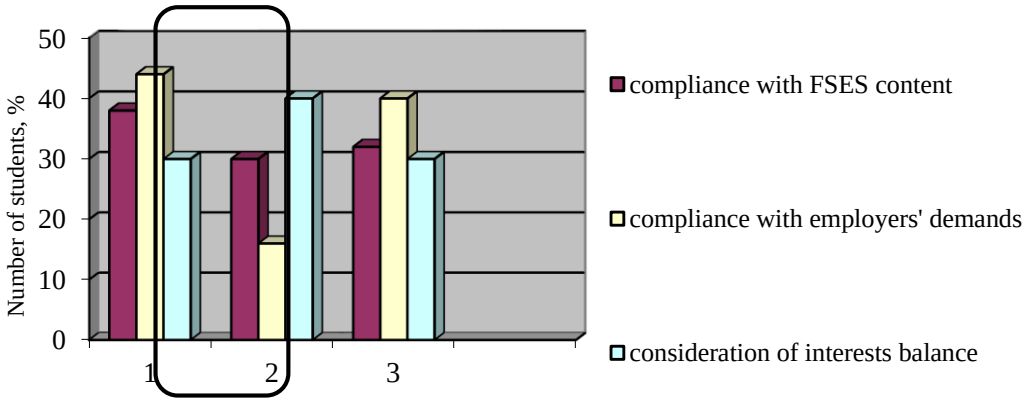
When the complete change of normative requirements takes place, for example, when FSES is introduced in all educational institutions, the projection trajectory through an expressly organized auxiliary link based on complex integration of vertical and horizontal information streams has provided the greatest effectiveness (trajectory 3).



where variable projection trajectories:
1 - parallel; 2 –serial; 3 – complex

Figure 4. The trajectory effectiveness of complex teacher training content projection under complete change of normative requirements

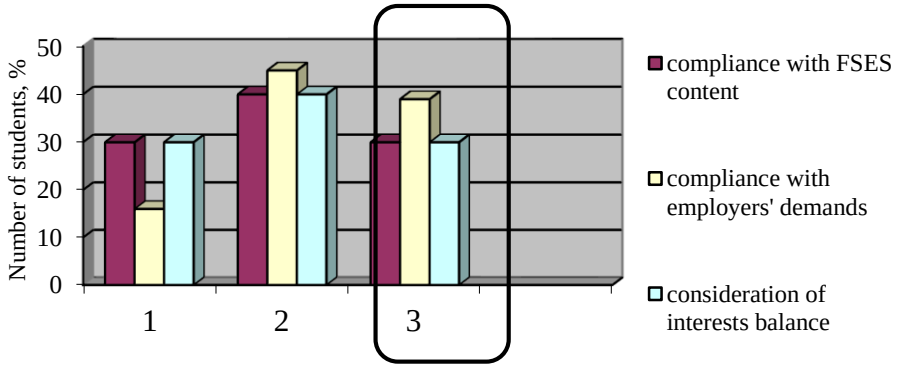
At the projection of a new training profile, the greatest effectiveness was shown by the trajectory of parallel projection based on the external integration of horizontal information streams which is founded on the interaction of the relevant divisions in higher education institutions of a uniform training profile and enterprises (trajectory 1).



where variable projection trajectories:
1 - parallel; 2 –serial; 3 – complex

Figure 5. The trajectory effectiveness of parallel projection for a new training profile

When the contents of the already developed training profile is updated, the trajectory of serial projection, based on the internal integration of vertical information streams founded on the content provision of basic academic subjects in full with the support of the existing standard, becomes the most effective (trajectory 2).



where variable projection trajectories:
1 - parallel; 2 –serial; 3 – complex

Figure 6. The effectiveness of serial projection trajectory under the updating of the developed training profile

At the levels of the academic subject content and learning topic content

To determine personal qualities and competences development, it was necessary to identify criteria and indicators. Taking into consideration the experience of personality traits diagnostics according to V.P. Ovechkin (2014) and the method of expert evaluations, there were selected the worked out systems of test tasks created for different categories of respondents and aimed to measure indicators of future teachers' personal qualities: a world outlook (O), pedagogical culture (C), technological literacy (L), projecting ability (P) and a goal-setting (G). Test tasks contained optional versions of answers on two indicators: 1) the compliance of personal qualities with the paradigm of the teacher training traditional content (property "T"); 2) the compliance of these qualities with the concept of the teacher training content adequate to the modern dynamic conditions of information society and innovative manufacturing development (property "C").

The average results of answers in the control and experimental groups before and after the forming experiment aimed to form competences that define future teachers' personal qualities are presented in table 1.

Table 1. The results of respondents' dichotomic selection in CG and EG before and after the experiment

Groups of qualities	Selection of answer	CG before experiment	EG before experiment.	CG after experiment	EG after experiment
O	T	0,76	0,68	0,74	0,31
	C	0,24	0,32	0,26	0,69
C	T	0,74	0,70	0,74	0,32
	C	0,26	0,30	0,26	0,68
L	T	0,75	0,67	0,73	0,26
	C	0,25	0,33	0,27	0,74
P	T	0,79	0,71	0,72	0,29
	C	0,21	0,29	0,28	0,71
G	T	0,79	0,73	0,75	0,23
	C	0,20	0,27	0,25	0,77

The results of the experiment show that the share of respondents who chose the teacher training content adequate to the conditions of information society and innovative manufacturing development (property "C") in the experimental groups increased after the forming experiment stage, and in the control groups the main part of respondents chooses the paradigm of the traditional teacher training content (property "T").

The change of personal traits (property "C") tested according to the corresponding criteria in the experimental (EG) and control (KG) groups is shown in fig. 8.

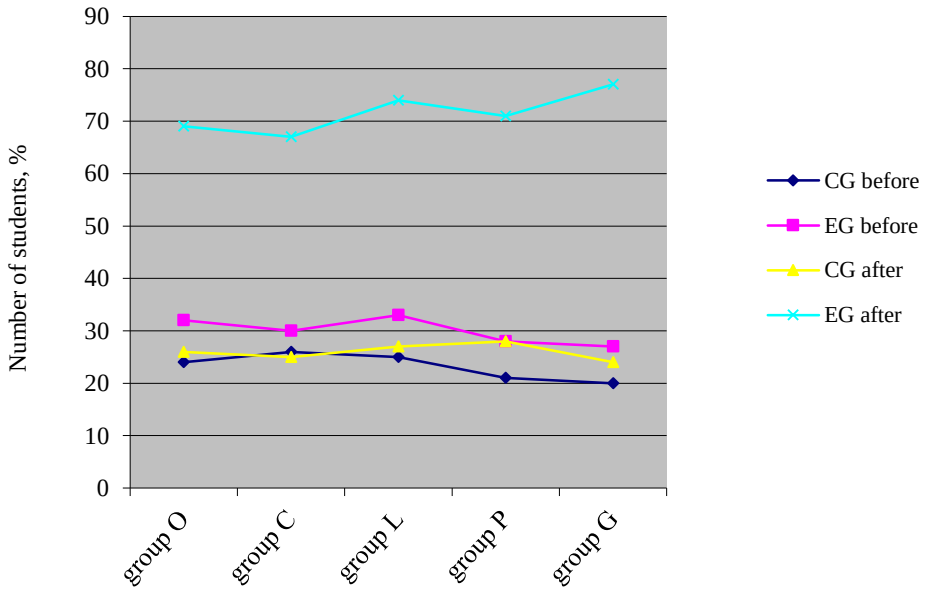


Figure 7. Change of personal qualities (property "C")

On the basis of the results of dichotomic selection made by testees before and after the forming experiment and calculation of the multipurpose statistical parameter φ^*_{emp}. (Fischer's criteria) in the control and experimental groups it is possible to draw a conclusion that in the experimental groups the gaged sign "C" in all groups of qualities developed by future teachers in the course of teacher training content implementation projected on the basis of information streams integration is statistically distinctive ($\varphi^*_{emp} > 2,31$) (according to D. A. Novikov) with the reliability of 95%.

At the level of the mastered competences content

There was carried out the questioning of students in the control and experimental groups to identify the motive of future teachers to exercise pedagogical and projecting activity (obtaining the diploma, mastering a profession, acquisition of knowledge). The results of questioning are presented in Figure 8.

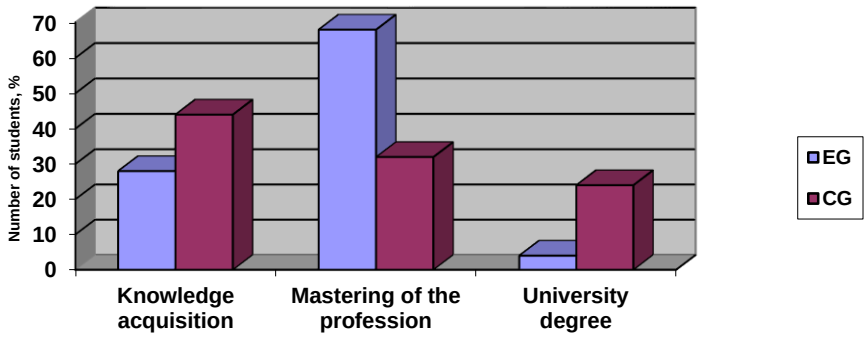


Figure 8. Leading motives of pedagogical and projecting activity

The results of the experimental work aimed to identify the motive of learning to implement pedagogical and projecting activity show that in the experimental group the motivation on the scale "Mastering a profession" prevails; we connect this with the fact that amendments reflecting the requirements of the modern social order have been introduced in the content of education. Students in the control group are focused on the acquisition of knowledge.

CONCLUSION

The suggested technology of teacher training content projection and implementation realizes basic functions: the identification of professionally significant competences of future teachers, the organization of information-environment interactions, the consideration of requirements for the content of pedagogical education, assessment of projection results; it also offers the option of variable logistic trajectories: parallel projection, serial projection and projection through an expressly organized auxiliary link. The selection of the projection trajectory depends on the character and innovations tendencies in pedagogical education: the trajectory of parallel projection based on the external integration of horizontal information streams is efficient at the projection of new teacher training content; the trajectory of serial projection based on internal integration of vertical information streams is efficient when teacher training content is updated; the projection trajectory through an expressly organized auxiliary link based on complex integration of vertical and horizontal information streams is efficient upon mass transition to the requirements of a new standard (normative requirements).

The conducted research may serve as the basis to carry out further theoretical and applied pedagogical researches regarding the vocational training content and process projection and implementation.

ACKNOWLEDGMENTS

The work is performed according to the Russian Government Program of Competitive Growth of Kazan Federal University

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