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Training of future general science teachers for productive methodical activity

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Abstract

The purpose of this article is to reveal the possibilities of higher education in the field of professional training of future general science teachers for productive methodical activity. The main method of research was a formative experiment. As a result, the research revealed the possibility to establish the correlation between the level of skills formation and capacities for productive methodical activity among students. In conclusion, young teachers staying in the profession is also attributed to the level of skills and abilities of productive methodical activity, as well as the experience of success and recognition.

Keywords: Higher education, professional, training, teacher.

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Formación de futuros docentes de ciencias generales para la actividad metodológica productiva

Resumen

El propósito de este artículo es revelar las posibilidades de la educación superior en el campo de la formación profesional de futuros maestros de ciencias generales para la actividad metódica productiva. El principal método de investigación fue un experimento formativo. Como resultado, la investigación reveló la posibilidad de establecer la correlación entre el nivel de formación de habilidades y las capacidades para la actividad metódica productiva entre los estudiantes. En conclusión, los jóvenes maestros que permanecen en la profesión también se atribuyen al nivel de habilidades y habilidades de la actividad metódica productiva, así como a la experiencia de éxito y reconocimiento.

Palabras clave: educación superior, profesional, formación, docente.

1. INTRODUCTION

Modern research in the field of teacher education shows the relevance of the problem of training for productive methodical activity in the context of national education systems (Bowe and Gore, 2017; Brody and Hadar, 2018; Shaidenko, 2014). The search for national higher education systems in this context are united by the presence of two areas in teacher education: subject training and professional (pedagogical, psychological, methodical) training. Shaidenko (2014) in his comparative study reveals two models of teacher education: synchronous (Austria, Belgium, Germany, Russia, etc.) and

consecutive (England, France, USA, etc.) models.

However, none of the above-mentioned models guarantees high quality of teacher education. Many countries face such problems as low interest in the pedagogical profession among young people that results in low quality of those choosing pedagogical higher education (low social status of the pedagogical profession with sufficient economic status) (Reliant); teachers' early professional burnout with its age limit inexorably decreasing (research team consisting of Väisänen et al. (2018) diagnosed the professional burnout of students at the stage of teacher education).

Moreover, the social pressure on the teacher's profession is extremely high, as the quality of teacher's professional training determines the quality of education in general (this was attested experimentally in the works of (Bowe and Gore, 2017). The most obvious challenge in teacher education is bridging the gap between professional training and teacher's actual pedagogical work. This gap is present in methodical training and psychological (emotional) readiness; as for subject-specific training, as a rule, students and young teachers do not have any problems. The teacher's methodical activity implies the ability to develop curricula, plan lessons or extra-curricular activity, diagnose various students' achievements and changes, and apply educational technologies and specific methods of teaching, correction and upbringing.

The quality of a teacher's methodological work can be

characterized as reproductive and productive. Reproductive quality of methodical activities is defined as the performance of the professional activity that corresponds to the standards. Productive quality implies developing individual methods of teacher education, accumulating of unique pedagogical experience, professional self-reflection. The latter contributes to a person's experience of success, as well as the qualitative shaping and development of teacher's professional identity.

In the Russian system of pedagogical education, the formation of the reproductive quality of the teacher's methodical activity is carried out during the period of professional training at the university (Jenaabadi et al., 2014). The productive quality of the teacher's methodical activities is developed during the period of direct professional practice with the assistance of regional, municipal and school methodological services. In essence, these services perform the functions of corporate training. The main channels for quality transfer of teacher's methodical activities are: generalization of actual pedagogical experience, participation in and organization of practice-oriented methodical activities (master classes, seminars, workshops, etc.), participation in innovation activities (federal and regional innovation sites), participation in professional communities (educational and methodical associations, creative groups, clubs, etc.), participation in professional skills competitions (Aksyonova, 2018).

The main gap is present precisely in the transition period: between the graduation and the first years of work at school. The young teacher in these years sees no prospects, channels of horizontal

and vertical mobility. As a consequence, he/she suffers early professional burnout, experiences disappointment, lack of professional identity and failure to get a foothold in the teaching profession (Blackmore et al., 2018; Sjöberg, 2018). In this respect, the main problem in teacher education is the search for efficient ways of anticipating the professional development of future teachers, namely, placing students in the context of specifics channels of teachers' productive methodical activity during the period of professional education at the university.

This problem takes on additional aspects in terms of education levels and subject areas. In particular, in the Russian Federation at the level of general education different subjects within the general science discipline are integrated, which strengthens trends of convergent education in teaching and research activities, extra-curricular activities, additional education, updating the natural history discipline in 10-11 grades for many profiles according to Federal-State Education Standards of secondary general education (Vasilyeva, 2004; Vereshchagina, 2012; Shatalov, 2004). As a consequence, on the one hand, teachers have wide opportunities for pedagogical creativity; on the other hand, there is a methodical vacuum (Stevenson et al., 2015). Thus, the purpose of this study is to reveal the possibilities of higher education in the professional training of future general science teachers for productive methodical activity.

2. METHODOLOGY

We used a formative the experiment as the main method of research. Experiment involved 3 groups of subjects. The first group of subjects comprised deputy directors of general educational institutions of the Lipetsk region, teachers, acting as mentors, listing 39 people from 21 schools.The second group of respondents (control group) was the subjects who studied pedagogical education (Biology, Chemistry) at the I.A. Bunin Yelets State University in the period from 2013 to 2017. The total number was 16 people with 9 of them, who began their professional activities as teachers of chemistry, biology in general educational institutions of the Lipetsk region.The third group of respondents (experimental group) comprised the subjects who studied pedagogical education (General science) at the I.A. Bunin Yelets State University also in the period from 2013 to 2017. The total number of 17 people, with 15 of them, who began their professional activities as teachers of chemistry, biology, physics, general science in general educational institutions of the Lipetsk region.

At the report and control stages of the experiment, the correlation between the level of formed abilities and competences of the productive methodical activity of the second and third groups during the period of study at the university and the level of development of horizontal and vertical mobility, emotional attitude to the profession and, ultimately, the degree of professional foothold in the respondents of these groups during the period of professional activity was established. The data obtained were correlated with the

assessment of the respondents in the first group. We used our developments as diagnostic tools. A paired Wilcoxon t-test criterion was used for statistical processing of results within the limits of changes in one quality; Student criterion was used for determining the statistical significance of the influence of one parameter on the other one.

At the heart of the formative stage of the experiment lay the idea to introduce those types of productive methodological activities that are characteristic of teachers' professional activities into the educational process. In particular, the educational activities of students were transformed in terms of changing the content and technologies of teaching methodical disciplines methodical aspects of general science teaching, new educational technologies in general science, fundamentals of project activities in the general sciences course, organization of research work in general science, additional education in general science and geography (studied in 6-8 semesters according to the curriculum), preparation of graduate qualification works and organization of production (pedagogical) practice.

The content of academic disciplines included topics that revealed the current situation and trends in the certification of teachers, the channels of career development, the technology of generalization and description of actual pedagogical experience, forms of transmission of successful educational practices. In addition, a number of topics in academic disciplines revealed certain ideas that are innovative for general science education at school: convergent

education, digital technologies, 3D modeling, nano-technologies, etc.In practical terms, the mastery of methods and channels of productive methodical activity was carried out through the application of project teaching technology.

Students worked on large group projects (3-5 people), dedicated to the development of a package of methodological documents that ensure the implementation of the above innovations for school science education: extra-curricular activities (additional program for general development), calendar-thematic plan, lesson development, didactic support for the implementation of the program, elements of lessons, diagnostic materials, methodological developments, short-term additional professional advanced training program, etc.

Detailed information on individual problems of the project topics was developed by students in the form of graduation papers. Moreover, in their writing they used stylistics and elements of generalization of actual pedagogical experience: information about experience (conditions of origin, formation of experience; relevance of experience; leading pedagogical idea of experience; range of experience; theoretical base of experience; novelty of experience; description of conditions in which it is possible to apply this experience), technology of experience description (determination of purpose and setting of tasks contributing to the achievement of this goal, description of changes introduced by the author of experience in the content of education (if any), description ofBlocks of works of the project also included the following elements: a speech on the theme

declared or writing an essay, conducting a lesson in the format of pedagogical practice, conducting master classes.

These activities are related to many tests of professional skill contests. All students of the group were involved in these events. The pedagogical practice was also modernized according to the principle of application of those developments, which students formed in the course of participation in the project. In the course of the internship, students were immersed in productive methodological activities: they participated in the process of using actual pedagogical experience, attended various stages of professional competitions of pedagogical skills, took part in practice-oriented events, and participated in the work of regional, municipal, and school methodical associations of teachers of natural sciences. In addition, at all stages of the project implementation, as well as during the organization of pedagogical practice, each experienced teacher was assigned a mentor teacher, who was directly involved in the process of editing the final qualification work and during the project implementation.

3. RESULTS

One of the first results of the study is that the current practice of methodological training of future teachers at the university is more aimed at developing the reproductive competence of future teachers. According to the data obtained, the majority of respondents in the control and experimental groups demonstrated high (37.5% and 41.2%,

respectively) and average (50.0% and 52.9%) levels of formed abilities and skills of reproductive methodical activity: drawing up a technological map of the lesson according to FSES, diagnostics of the level of formation of planned learning outcomes, the use of educational technologies that are consistent with the system-activity approach (T for the control group: Temp = 20.5; T for the experimental group: Temp = 24.6) (Jalali Nezhad and Jenaabadi , 2014).

At the same time, there is a deficit of formed skills and abilities of productive methodical activity in students: those of control group showed insignificant quantity of high and average level (6,3 % and 18,8 % accordingly) unlike students of experimental group (35,3 % and 47,1 % accordingly) (T for control group: Temp = 40.3; T for the experimental group: Temp=25.0). The study of the qualities and competencies of the respondents of the second and third groups, contributing to horizontal and vertical mobility in the professional sphere, allowed to establish a higher level of formation in the experimental group: 80% of respondents clearly know the channels and methods of horizontal and vertical mobility; 73.3% have a clear career plan; 86.7% take an active part in various forms of productive methodical activity (Eisvandi et al, 2015).

The test subjects of the control groups showed lower results: 44.4% of respondents know the channels and methods of horizontal and vertical mobility; 22.2% have a clear career plan, and 33.3% are self-development practitioners in terms of methodology. Application of Student's t-criterion for coherent samples allowed to establish

statistical significant dependence of high level of skills and abilities of productive methodical activity and qualities and competencies contributing to horizontal and vertical mobility in the professional sphere among the respondents of the experimental group (temp = 5.86 at k = 14) and low level of these indicators among the respondents of the control group (temp = 6.94 at k = 8).

A similar picture is also observed in the measurement of the level of emotional attitude towards the profession: respondents of the experimental group demonstrate more positive emotions towards the profession (73.3%) than respondents of the control group (22.2%). The correlation between the level of formation of skills and abilities of productive methodical activity and emotional attitude to the profession is confirmed statistically (for the respondents of the experimental group of samples = 6.11 at k = 14; for the respondents of the control group samples = 7.28 at k = 8). Accordingly, the consolidation of respondents in the profession is conditioned by the level of development of skills and abilities of productive methodical activity, obtaining by young teachers of the situation of success and recognition (Vargas et al, 2019).

Thus, only 9 out of 16 students from the control group went to work as teachers, 15 out of 17 from the experimental group. Only 3 respondents in the control group plan to continue their professional activity as teachers, 4 are considering the possibility of changing the sphere of professional activity, and 2 have already found work in other positions. In the experimental group, 11 respondents are satisfied with

their professional activity and plan to carry it out in the future, 4 are considering the possibility of changing the sphere of professional activity. Assessments of the respondents of the first group (deputy directors and mentor teachers) and of the second and third groups coincided with the results of diagnostics: the experimental group was highly appreciated in professional terms, young teachers' mentors noted their purposefulness, desire to develop professionally, learning ability and optimism; young teachers from the control group respondents, on the contrary, were assessed as inert, pessimistic, having deep subject knowledge, but unable to do so (Shukla, 2017).

4. DISCUSSION

The results obtained during the study are partially consistent with the results identified by other authors. In particular, Sjöberg discovered that in the course of professional training, the Swedish teachers form solidly the subject-specific knowledge of reproductive methodological skills, but they have difficulty in situations requiring analysis, forecasting, etc., that is, productive activities, in the real professional activity. Väisänen et al. (2018) determined that excessive training of Finnish future teachers adversely affects their emotional attitude to the profession Blackmore et al. (2018) concluded that restricting the research activities of UK students in the process of professional training also significantly reduces the quality of their professional activities in the future. In the context of the examples given, it is obvious that the success of students' professional activities

in the future is influenced by immersion into productive, methodical, scientific or debatable activities.

5. CONCLUSION

Our study allowed us to establish that the solid subject and scientific-theoretical didactic training of students does not ensure the success of future professional activities. Moreover, success involves not only the quality of pedagogical work, but also the feeling of emotional comfort by a young teacher, his experience of a situation of success, a clear vision of his career. In this paper, a clear relationship was established between the future immersion of the future teacher of natural science in productive methodological activities and the success of his professional activities as a teacher.

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