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Methodical system of training of future elementary school teachers for teaching younger schoolchildren narrative mathematical problems solving

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Abstract: In this article there is introduced a methodical system that implements a complex of educational environment: creation of the competence-based model of the future elementary school teacher in teaching of narrative mathematical problems solving; development of competence-oriented program of the course "Methods of teaching mathematics in elementary school", in particular, the modules relating to methods of teaching problem solving; the use of learning technologies that provide content for future modeling career and active involvement of students in learning activities. The aim of methodical system is to form methodical competence of the future teachers in teaching younger schoolchildren to solve problems, the content includes knowledge, skills and activities experience that are the basis of methodical competence of teachers in teaching problem solving. The article represents the interpretation of the definition of "methodical competence of primary school teachers in teaching younger schoolchildren problems solving", its structure is characterized by the composition of the valuable motivational, cognitive, activity-oriented and reflective and creative components. The essence of the activity and cognitive components is specified through constituent components of their competencies: normative, selective, public-methodical, control and evaluation, design and modeling and technological. Methodical system is realized by means of semantic modules relating to methods of teaching problem solving in the course of a special course "Methods of teaching mathematics in elementary school." Therefore, teaching methods, according to the methodical system are a lecture, a workshop, self study and project work of the students/pupils. The article represents a problem lecture scheme and workshop scheme using interactive technologies, situational and contextual teaching. Due to experimental verification of the effectiveness of the developed methodology of implementing the complex educational environment in the experimental groups were observed statistically significant changes at the levels of methodical competence of future teachers in teaching younger students problems solving.

Keywords: teacher's professional competence, elementary school teacher, methodical competence, narrative mathematical problems.

The development of the national system of higher education in Ukraine on the principles of competence-based approach requires the gradual implementation of European norms and educational standards for the content of higher education and specialists' training. In this regard, in 2011, National Qualifications Framework was approved (Resolution of the Cabinet of Ministers of Ukraine of November 23, 2011 No 1341), in which the results of education are prescribed at every qualification level in the form of competencies that a person is able to demonstrate in standard and non-standard situations after finishing education program. Therefore, at the present stage of development of higher pedagogical education the aim of professional education of the future teacher is recognized as the acquisition of their professional competence.

In the structure of the professional competence of the teacher methodical competence there occupies an important place, which is interpreted by us as a personal educational system, which manifests itself in the ability to implement and organize the process of learning the subject at the up to date requirements level; in the possibility of successful methodological problems solutions based on the theoretical and practical readiness to teach the subject. Methodological competence is understood as a basis, an internal reserve of methodical competence, based on thematic-scientific, didactic and meth-

odological and psychological knowledge, skills in methodical tasks solving, available experience in the subject of teaching, emotional and valuable attitude to this process.

The subject of our study is methodical competence of the elementary school teacher in teaching mathematics. Its structure is represented by the composition of the valuable motivational, cognitive, activity-oriented and reflective and creative components. Based on the content of primary school teacher's activities in teaching mathematics younger schoolchildren, a cognitive nature and activity of components through the components of competence is presented: normative, selective, public-methodical, control and evaluation, design and modeling and technological.

In 2011, the Cabinet of Ministers of Ukraine approved a new edition of the State standard of universal primary education which is significantly different from the previous one [2, 1-18]. Significant changes have occurred in the education industry "Mathematics" - there appeared a separate semantic line "Narrative problems." "Narrative problems" is a separate section of the program, which defines kinds of problems and general techniques for working over them from the 1st to the 4th grade. Meanwhile, production functions and their corresponding standard tasks of activities prescribed in the educational and professional qualifications characteristics (an-

nex to the Industry standard of Higher Education on Direction of preparation 6.010102 "Primary/Elementary education"), remained unchanged [3, 271-320]. Thus, there is a discrepancy between the increasing role of content line "Narrative problems" in the course of mathematics for 1 - 4 grades and the lack of purposeful development of methodical competence in teaching younger schoolchildren narrative mathematical problems solving in the process of training of elementary school teachers in a higher educational establishment.

Methodical competence of the teacher in teaching younger schoolchildren narrative mathematical problems solving lies in the ability to implement and organize the process of teaching younger school children problems solving at the up to date requirements level; in the possibility to solve successfully the methodological problems that arise in the process of teaching. Methodological competence is based on the theoretical and practical learning readiness of primary school students narrative mathematical problems solving.

Based on the structure of methodical competence of primary school teachers in the teaching of mathematics, we have specified the activity and cognitive components of the methodical competence in teaching narrative problems solving, and also content of the normative, selective, public-methodical, control and evaluation, design and modeling and technological competence in the context of qualification requirements for training of primary school teachers. It is established that the backbone of the normative, selective, public-methodical, control and evaluation, design and modeling and technological competence is private and methodical competence. The leading competence in this hierarchy is the regulatory competence because it regulates, directs the activities of the teacher to achieve certain goals and tasks of the content line "Narrative problems" that are prescribed in the regulations.

Based on the structure of methodical competence of future elementary school teachers in in teaching younger schoolchildren narrative mathematical problems solving criteria (motivational, substantial and operationally-activity) are identified; also indicators are specified of methodical competence of elementary school teachers in teaching younger schoolchildren narrative mathematical problems solving and provided a qualitative description of the four level of development of methodical competence of elementary school teachers in problem solving education: elementary, medium, sufficient and advanced.

The structure of methodical competence of elementary school teachers in teaching problem solving, the qualitative characteristics of the levels of formation will present its professional competence

model which is the basis for the development of competence-oriented course program through which students acquire methodical competence in teaching problem solving.

Thus, the effective formation of methodical competence of a future elementary school teacher in teaching problem solving is possible when provided a competence model of the future teacher and the development of competence-oriented program of the course "Methods of teaching mathematics in elementary school," including semantic modules related to the educational techniques of teaching problem solving [4, 151-154]. To be carry out by the future teachers the process of acquiring the methodical competence it is appropriate to use educational technologies that create the ability to model the content of future careers and providing involvement of students in active cognitive activity. Also, the development of suitable training and methodological support modules on teaching methodology regarding to problems solving by the younger schoolchildren in the form of an electronic manual "Methods of teaching narrative math problems solving for the pupils of 1-4th grade."

To implement the conditions mentioned by us the methodical system of training of primary school teachers to teach younger students narrative mathematical problems solving .

The purpose of training according to the proposed methodology is to develop a system of primary school teachers methodical competence in teaching problem solving. To achieve this objective the expected result must be clearly designed as a competence model of the future elementary school teacher which is a characteristic of constituent components of methodical competence of elementary school teachers, designed at the level of teaching problem solving (the structure of methodical competence of primary school teachers in teaching problem solving), and qualitative characteristics of the levels of formation of these components: elementary, medium, sufficient and advanced. In such a way, there was implemented pedagogical condition of methodical competence formation of future teachers of elementary school by creating a competency model for the future elementary school teachers in teaching narrative mathematical problems solving.

Since the model of methodical competence of primary school teachers in teaching problem solving fully reflects the possible professional functions and tasks performed by the teacher in teaching problem solving and takes into account the requirements of the present stage of development of primary education, the learning content in the presented methodology can be considered as constituting a system of methodical competence of elementary school teach-

ers in teaching problem solving. Thus, the content of teaching lies in knowledge, skills and experience of training younger schoolchildren in narrative mathematical problems solving that are the basis of the components of the methodical competence. This content is required by the students through the discipline "Methods of teaching mathematics in elementary school." Competence model of primary school teachers is the basis for the development of competence-oriented program of the course of this discipline. Thus, realized pedagogical condition for the development of competence-oriented program of the course "Methods of teaching mathematics in elementary school", in particular the semantic modules on teaching problem solving techniques.

In competence-oriented syllabus it is provided purposeful formation of methodical competence in teaching narrative mathematical problems solving by determining the didactic goal stated in accordance with the functions of the future professional activity provided that each module provides a substantial increase in specific competence of the student. In it there is the content of the training modules that provide the basis for the formation of competencies; defined lists of competencies and skills acquired by students through the mastery of each module; defined the types of tasks by which this happens, is the number of points a student can receive for certain tasks.

Mastering the course "Methods of teaching mathematics in elementary school" comes in the form of lectures, workshops, self-study and classroom projects. We have improved the methods of lectures by implementing the technology of problematic learning; improved the methods of practical training through interactive technology, situational and contextual learning [1, 35-41].

Problem lecture scheme on the study of individual modules on teaching methodology in narrative mathematical problems solving in the course "Methods of teaching mathematics in elementary school", comprises the following steps: I. Motivation of students' learning activity (activity of the teacher). II. Creation a problem situation and problem statement (activity of the teacher). III. Analysis of the given issue: education program on the subject, an analysis of existing textbooks, examination of various methodological approaches, and view video segments lessons (activities of the teacher and the students). IV. Reflection of the self-learning activities of students (student activities). V. Formation of the hypotheses is the selection of one of the considered methodological approaches, through which the most effective form concepts and skills (students' activities). Actually, the proof or denial of the hypothesis occurs during the students' independent work, which involves the analysis of the considered

methodological approaches, the allocation of the benefits and drawbacks of each. Tasks for independent work may include a requirement to illustrate the approach with specific examples, making a comparative analysis of existing textbooks to meet a particular topic, and drawing up a compendium (draft) of the lesson, development of a system of training tasks, etc. Organization of independent work of students, its methodological support is possible through training and methodological manuals in electronic form, "Methods of teaching mathematical problems solution for the students of 1 - 4 grades."

Selecting a methodical approach having learnt to implement it during the solution of educational problems, the students are ready to discuss the results on a practical lesson. The dominant technology training which we believe should be applied to the practical session is an interactive technology and situational and contextual learning. In order to introduce these technologies to improve the efficiency of the formation of methodical competence of elementary school teachers we have proposed a scheme of practical lessons: 1) The explanation of the selection and illustration for chosen methodological approach (speech based on the reports), 2) discussion (upholding the selected item), and 3) the implementation of the selected methodological approach in solving professional problems (situational task solution).

At the final stage of mastering the students a meaningful unit, they are encouraged to choose a topic of educational project involving the creation of new educational product on the basis of the chosen methodological approach. In this educational product may be a compilation of educational objectives for training, familiarization, formation of concepts, skills in pupils of elementary school or the development of a draft-plan (the project) of the lesson. Thus there is a realization of pedagogical conditions regarding the use of learning technologies, providing content for future modeling career and the active involvement of students in learning activities.

The main medium of teaching, according to the methodology proposed system is an e-book "Methodology of training of narrative mathematical problems solution for the students of Grades 1 - 4," by which the opportunity is created for the students' free access to the plans and the content of lectures, list of primary and secondary literature, even to the corresponding literature sources; to tasks for independent work and guidelines for it, to the practice tests and tasks for self-examination, to the plans for the practical exercises; to scale evaluation of educational achievement, subject to the conditions noted.

As a result of the formative experiment there are recorded statistically significant changes in the lev-

els of methodical competence in teaching younger students problems solving when the students of the experimental group have been compared with the control group students. During the analysis of the

experimental data, we concluded that the effectiveness of the developed methodology of training of primary school teachers to teach younger students narrative mathematical story problems solving.

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Методическая система подготовки будущих учителей начальных классов к обучению младших школьников решению сюжетных математических задач

Аннотация: В статье презентована авторская методическая система, реализующая комплекс педагогических условий: создания компетентностной модели будущего учителя начальных классов в обучении решению сюжетных математических задач; разработки компетентностно-ориентированной программы курса «Методика обучения математике в начальной школе», в частности модулей, касающихся методики обучения решению задач; использования технологий обучения, предусматривающих моделирование содержания будущей профессиональной деятельности и активное включение студентов в учебную деятельность. Целью методической системы является формирование у будущих учителей методической компетентности в обучении младших школьников решению задач, содержание - представляют знания, умения и опыт деятельности, являющиеся базисом методической компетентности учителя в обучении решению задач. В статье представлена трактовка дефиниции «методическая компетентность учителя начальных классов в обучении младших школьников решению задач»; ее структура охарактеризована посредством композиции мотивационно-ценностного, когнитивного, деятельностного и рефлексивно-творческого компонентов. Сущность когнитивного и деятельностного компонентов детализирована посредством составляющих их компетентностей: нормативной, вариативной, частно-методической, контрольно-оценочной, проектировочно-моделирующей и технологической. Методическая система реализуется посредством содержательных модулей, касающихся методики обучения решению задач, в курсе специальной дисциплины «Методика обучения математике в начальной школе». Поэтому формами обучения, согласно методической системе, являются лекция, практическое занятие, самостоятельная работа и проектная деятельность студентов. В статье презентована схема проблемной лекции и схема практического занятия с использованием технологий интерактивного, ситуационного и контекстного обучения. Вследствие экспериментальной проверки эффективности разработанной методической системы, реализующей комплекс педагогических условий, в экспериментальных группах зафиксированы статистически значимые изменения в уровнях методической компетентности будущих учителей в обучении младших школьников решению задач.

Ключевые слова: профессиональная компетентность учителя, учитель начальной школы, методическая компетентность, сюжетные математические задачи.