Sviatlana Gadzaova*, Halina Murauyova**, Maryia Urban***

Preparation of Future Primary School Teachers to Implement Ideas of Sustainable Development in Maths Classes

Abstract. Sustainable development in education is the basis of sustainable development of society. To ensure sustainable development in education, its principles need to be implemented in all training courses. Higher pedagogical education should provide training in designing and teaching such courses. At our universities, future primary school teachers are trained to keep their maths lessons in line with the principles of sustainable development in three key areas. The first area relates to the development of pupils' social involvement through their acquisition of intellectual and practical skills of using maths. The second area concerns pupils' relationship with their natural and cultural environment. Future teachers are trained to design tasks that stimulate pupils' emotional engagement and caring attitude. The third area that future teachers are trained to target is pupils' economic and financial competence. Teaching skills in all these areas can be developed effectively through the case method.

Keywords: education for sustainable development, methods of teaching maths, primary school teachers, case method of teaching, modelling skills

1. Introduction

The sustainable development strategy focuses on three main aspects: development of a highly intelligent person capable of solving creative problems; preservation of the natural and cultural human environment; formation of economic

* Yanka Kupala State University of Grodno, Department of Natural and Linguistic Sciences and their Teaching Methods, e-mail: gadzaova_svetlan@mail.ru, phone: +375 29 887 06 14.

** Maxim Tank Belarusian State Pedagogical University, Department of Natural Sciences, e-mail: m.galina62@gmail.com, phone: +375 29 365 02 25.

*** Maxim Tank Belarusian State Pedagogical University, Department of Natural Sciences, e-mail: maria.urban62@gmail.com, phone: +375 29 774 38 55.

thinking and prudent use of the natural and financial resources [*Ustoychivoe razvitie* 2011]. The National Strategy for Sustainable Socio-Economic Development of the Republic of Belarus Until 2030 emphasizes the importance of sustainable development in educational processes [Natsionalnaya strategia 2015].

To implement the idea of sustainable development in the process of training primary school teachers it is important to develop specific teaching methods. Mathematics Teaching Methodology is one of the leading subjects in the curricula of the faculties preparing primary school teachers. The effectiveness of the development of students' competence to form appreciating attitude to the environment in children largely depends on close connection between this subject and the ideas of sustainable development.

The Mathematics school course offers a number of opportunities to educate an individual in accordance with the ideas of sustainable development:

– mathematics can facilitate development of intellectual skills vital to solve creative problems, to explore and preserve the human environment. Modelling plays a special part in the system of intellectual abilities, being both mathematical and intellectual ability. The experience of modelling is a valuable skill opening for the person the possibilities of independent cognition and continuing the process of education during the life [Gadzaova, Murauyeva & Urban 2015];

– through the content of verbal arithmetic problems children can get acquainted with quantitative information that reflects the real environmental problems of the region and the cultural heritage of their native land;

– verbal arithmetic problems may contribute to the formation of pupils' economic thinking and prudent attitude to the natural resources and to the family budget alike.

To enable a teacher to fully exploit the potential of mathematics to implement the ideas of sustainable development in the classroom, the process of university training must embody active methods of teaching students to develop the corresponding mathematical tasks for children. The experience of teaching Mathematics Methodology at the Maxim Tank Belarusian State Pedagogical University and the Yanka Kupala State University of Grodno proves that teaching students to develop such tasks becomes more efficient when using the case method.

2. Formation of intellectual and practical activity by means of mathematics

The development of intellectual and practical activity is based on human ability to analyze and build models of natural, social and economic processes. The ability to build models is the basis of a creative approach to solving real problems,

because, according to G. Altshuller, the transition from a practical problem to its model makes it easier for a researcher to identify the physical contradiction constituting the core of the problem situation [Altshuller 2011].

Modelling in teaching mathematics is seen as a didactic "projection" of the method of mathematical modelling, the essence of which is a cyclical process of solving real problems by mathematical means. In the most general form, the process of mathematical modelling can be presented as a mathematisation cycle offered by J. de Lange: real-word problem – mathematical problem – mathematical solution – real solution [De Lange 2006].

Understanding the nature of the process of mathematical modelling was the basis for the didactic studies on the problem of forming pupils' ability to model. Despite the widespread view, according to which mathematical modelling should be taught in middle and high school [Galbraith & Stillman 2001], several researchers note that some elements of mathematical modelling may be available and useful in teaching junior schoolchildren [Lehrer & Schauble 2003; English & Watters 2005].

The problem of using models in the primary mathematical education is traditionally linked to visual representations due to the specifics of the mental processes in children of this age group. This is why the manuals for grades 1-4 are normally provided with many illustrations. However, not every visual representation contributes to a better comprehension of mathematical concepts, but models do. One of the first mathematicians to raise the question about the problem of using visual (graphical) models in teaching mathematics was J.E. Littlewood [1953], but the concept of visualization got widespread in teaching mathematics only at the end of XX – beginning of XXI century [works by Bartolini Bussi & Mariotti 2008; Giaquinto 2007; Goldin 2002; Reznik 2012, etc.].

A number of studies underline that for the understanding of mathematical ideas the importance lies not in the visualization itself, but rather in "flexible and competent translation back and forth between visual and analytic representations of the same situation" [Arcavi 2003: 235]. Therefore, internal representations of mathematical concepts that support the understanding can be of different nature, because they are the mental configurations of a personality [Goldin & Caput 1996].

Of course, visual representations of key concepts of mathematics are very important for the formation of mathematical thinking, especially in the early school years, but they can and should also be verbal, notational, strategic or even affective [Goldin 1998].

Thus, in the process of searching a solution to a problem, beside visual models children learn to use verbal and symbolic models of the problem. The natural language is used to construct verbal models and symbolic models use the language of mathematical symbols. Ability to present the same idea by means of

different languages (visual, verbal or symbolic representation) promotes the formation of representational fluency [Goldin 2002] and is an important social skill of the modern individual [English & Watters 2005].

The set of math's educational materials, based on the ideas of using modeling as an instrument of problem solving, was launched in the Republic of Belarus in 2011. The set of books consists of a textbook, tutor's manual, writing book, test book, writing book for challenging tasks and digital educational resource. Figure 1 shows an example of visual, verbal and symbolic models of verbal problems in Grade 2 Mathematics Textbook [Muravyova & Urban 2016], and figure 2 – examples of models made by children.

Figure 1. Example of visual, verbal and symbolic models of verbal problems in the Belarusian teaching materials in Mathematics

Source: Muravyeva & Urban 2016.

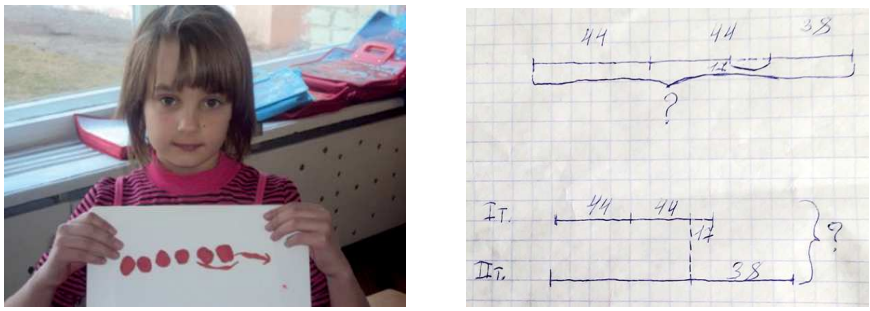

Figure 2. Examples of models made by pupils

Source: own elaboration (photo by M. Sharapa and J. Talai).

Methodical preparation of students in this area includes, first, training students to use models in the search for solutions of verbal problems, and second, development of the competence of future teachers to form the modelling ability in primary school children.

3. Formation of respect for the natural and cultural environment

An arithmetic problem can have a rich educational potential manifested in a story contained in its text. At the Maxim Tank Belarusian State Pedagogical University and the Yanka Kupala State University of Grodno the practical preparation of future primary school teachers includes methodical tasks on developing verbal arithmetic problems with cultural and environmental content. These tasks help to enhance pupils' positive and caring attitude to their natural and cultural environment. Verbal arithmetic problems developed by students may:

– highlight the implications of the global climate change.
– cultivate love to the nature and culture of Belarus,
– raise awareness about the importance of the nature protection in Belarus,
– motivate children to contribute to the development of Belarusian culture.

The following are examples of verbal arithmetic problems developed by students:

1) The area of Belarus is 207 600 km^2. One tenth of the surface is covered by swamps. The area of swamps taken under protection is about one-tenth of their total area. In the future, this number will increase by a factor of 3. How many square kilometres of Belarusian swamps will be subject to protection?

2) In 2009, a cycling path going through the whole city was built in Minsk. The length of the cycling path is 26 km 800 m.

– How long would father's return trip on the path take if his speed is 13 400 m/h?

– How many litres of petrol would father need if he was to cover this distance by car, considering that the car consumes 10 litres per 107 km 200 m?

3) Niasvizh Castle was built in the late 16th century. The restoration of the castle began in 2004, and in 2012 the restoration was completed. How many years did it take to restore the castle? How many centuries have passed from the construction of the castle until the completion of its restoration in 2012?

4. Formation of economic and financial literacy

In respect to formation of economic and financial competence, future teachers can create two types of project problems:

– projects showing children the need to limit the consumption of the natural resources,

– projects teaching children to use the family budget efficiently.

The following are examples of projects that can be offered to primary school pupils.

1) Project "Limit the Consumption of the Natural Resources"

Note how much time you spend brushing your teeth in the morning. Count how many litres of water run from the tap during this time. Calculate how many litres of water can be saved per year by using a glass when brushing teeth.

2) Project "Family Budget"

Your mobile provider offers two rate plans. The first suggests paying 1 rouble 20 kopecks per 5 minutes. The second is 7 kopecks per 10 seconds. Which rate plan is a better deal for your family budget?

3) Project "Fighting Air Pollution"

It is known that a car emits into the atmosphere 20 g of carbon monoxide per 1 km and a truck emits 170 g per 1 km. One tree processes 2 kg of carbon monoxide in 1 hour on average. How many vehicles pass by your house in 1 hour and how many trees must be planted along 1 km to clear the air of carbon monoxide?

4) Project "Family Car"

Does your family own a car? How many kilometres a week does your car run? How much money does your family spend on the car per week if the car consumes about 15 litres of gasoline per 100 km and the price of 1 litre of gasoline is 1 rouble 10 kopecks? How much money can the family save if it chose to use public transport or bicycles during that period?

5. Application of the case method in teaching students

The case method has long established itself as one of the most effective teaching techniques for adults, especially in the field of economics and business education. The case method is based on the holistic review and analysis of real life situations (people, events, decisions, etc.) [Thomas 2011]. The case method aims to encourage pupils to find a way to overcome the difficulties faced by the main character(s) of the case [Leenders & Erskine 1989]. The generation of the ways to solve the problem presented in the case is a particularly valuable component of the process of working with cases [Woodside 2010].

Several studies have underlined the effectiveness of the case method for the realization of the ideas of sustainable development in the university training of students [Kostyuchenko & Smolennikov 2016]. Using the basic ideas of the case method in the mathematical training of primary school teachers seems to be not only possible but also feasible [Urban 2003].

Caselets, or short cases, are a special variant of cases that a teacher can use in the classroom. Such cases feature small size (up to three pages) so they can be used for practical lessons with students without special preparation at home. The studies note that the use of caselets is now becoming a very popular means of training as it is easier to adapt a short case to a particular topic, audience or a particular teaching style [Selvam, Babu & Raja 2006]. The experience of using caselets in teaching shows that in spite of their small volume caselets, as well as a "big" case, allow students to practice applying theoretical ideas to solving real life problems [Gladkikh 2008].

To realize the ideas of sustainable development in the course of Mathematics Teaching Methodology it is important to offer students specially designed cases. Such cases should be based on the following principles:

– the principle of an underlying **verbal arithmetic problem**. In accordance with this principle, the central element of the case should be a verbal arithmetic problem with the content allowing to reveal the challenges of sustainable development;

– the **poly-directional** principle, which involves the organization of several thematic working groups of students to analyze the proposed case from different points of view (mathematical aspect, cultural and environmental aspect, economic aspect);

– the principle of **minimalism**, according to which the case should be short (no more than one page text), which allows its successful analysis by students during one practical lesson lasting 90 minutes.

6. Practical application of the case method in the process of training students to conduct mathematics lessons in primary school

The Maxim Tank Belarusian State Pedagogical University and the Yanka Kupala State University of Grodno have developed a series of cases (caselets) for practical activities with students, which associate the formation of methodological and mathematical competence of future teachers with the implementation of the ideas of sustainable development. Here is one of the cases developed for practical activities on the topic "Methods of Working on Problems with Proportionate Quantities". The topic was chosen due to the fact that problems with proportional quantities describe many processes in the environment and make it possible to organize purposeful work on formation of the initial concepts of functional relationships of the quantities [Gadzaova 2014].

For the development of cases we applied the case structure recommended by the scientific literature [Gladkikh 2005], which usually contains the following sections:

1. Case text.
2. Questions for discussion.
3. Applications.
4. Teaching notes.

In this article, we do not intend to provide methodical guidelines for the work with cases (teaching notes), thus, only a brief description of the three main sections will be presented: case text, questions for discussion and applications.

Case Name: Designing a lesson on the topic "Solving Problems with Proportional Quantities"

Case Content: During teaching practice at school a student held a mathematics lesson in the fourth grade. The list of the lesson goals included the following: to consolidate the ability to solve problems with the 4th proportional by the method of relationships; to consolidate the ability to solve problems in the determination of the price, quantity and value; to cultivate respect for the natural resources; to teach to plan the family budget. To realize these goals the trainee planned to work on two verbal problems:

– A family of three people consumes 285 litres of water per day. How much water is consumed per day by a family of four, if water consumption per person is almost equal?

– Father paid 24 roubles for 8 m of wire. Is 5 roubles enough for father to buy other 4 m of the wire?

During self-analysis the trainee stated that she was satisfied with the lesson because the children had time to write the solutions of both problems in their notebooks and the contents of the problems helped to achieve the educational goals of the lesson. However, the students and teachers who attended the lesson thought that the lesson goals were not achieved. During the discussion of the lesson several comments were made.

Comment One. The work on the problems did not correspond to the consolidation stage; the children did not show independence. The solution of the problem through relationships was not discussed; the potential of the model was not used to find the solution of the problem through relationships. The first problem could not be solved in two ways, and when solving the second problem the method of relationships was not discussed.

Comment Two. Educational potential of the content of the problem to form in children the respect for the Belarusian natural resources was not used. The teacher did not hold any discussion about the importance of conservation of freshwater reservoirs in the country and around the world and did not focus children's attention to the problem of rational water consumption.

Comment Three. The lesson did reveal the relation between saving the natural resources and planning the family budget, the texts of the problems were not correlated with the social problems of the family.

The student was offered to prepare and hold another lesson taking into account the comments made.

Questions for discussion

1. How to organize the work on the proposed tasks to form the understanding of the functional relationships of values by means of modeling? What methodical techniques will you use at the stage of searching solutions to the problem? What changes must be made in the text of the first problem to allow two ways of solving by the arithmetic method? Can you offer any other ways to organize creative work on the problem after its solution? Prepare a presentation of the group ideas.

2. How to organize the work on the first task to contribute to the development of respect for the nature of the native land? What methodical techniques will you recommend to apply? What environmental information will you need? Prepare a presentation of the group ideas.

3. How to organize the work on the proposed tasks to create conditions for the realization of the goal of building skills of rational use of the family budget? What methodical techniques do you recommend to apply? How can you work on the problem after its solution? Prepare a presentation of the group ideas.

Applications

Article 1.

Provision of clean drinking water is one of the major social and environmental challenges, the solution of which aims at the preservation of human health. The main source of drinking water for the population of Belarus is groundwater, and in Minsk and Grodno water from surface sources is used for these purposes. Industrial enterprises and agricultural complexes also require significant water consumption.

Water quality depends on human activities. Industrial wastes, sewage from agricultural and cattle-breeding complexes bring to the rivers various harmful substances (oil products, metals, fertilizers, etc.) that pollute the water sources. The condition of water also depends on the proximity to major population centres and the state of the treatment plants. E.g., 2 liters of engine oil discharged into the river will contaminate the volume of water equal to 5 swimming pools. Thus, the Svisloch River is one of the most polluted rivers in Belarus, and the Neman River is one of the cleanest rivers in our country.

Article 2.

The needs of the modern society require a lot of water. Belarus has sufficient water, but at the moment 22 countries in the world already experience a chronic

shortage of water, and by 2025 their number will increase to 32 countries. This means that water intake per capita in these countries amounts to 1 000 000 liters per year while the standard rate is 1 800 000 liters per year.

Drinking water consumption per capita in cities ranges from 140 liters to 370 liters per day. Due to the installation of individual water meters in Belarus, the population tends to reduce water consumption. 1000 liters of water cost about 47 kopecks at the consumption of up to 140 liters per day per person and 69 kopecks at the consumption in excess of 140 liters per day per person.

During one day an average person uses water for: hand washing – 8 liters; tooth brushing – 9 liters, if the tap is not closed; washing fruit under running water – 15 liters; taking a shower – 15-20 liters per minute; taking a bath – 150 liters; laundry – 130-150 liters at a time.

Having read the case, the students were divided into three groups in accordance with the notes provided in the text. One group analyzed the situation from the point of view of achieving the mathematical objectives of the lesson, the second group considered the cultural and environmental aspects, and the third group reviewed it from the perspective of the family budget. The groups worked for 30 minutes and then presented their solutions. Each presentation lasted about 10 minutes. After presentations of the group solutions a 30 minute group discussion was held, during which the students came to the conclusion about the possibility and feasibility of combining methodical and socially important educational ideas in teaching to solve verbal arithmetic problems at a mathematics lesson.

7. Conclusion

To achieve the goals of sustainable development it is necessary to represent its ideas both in the content and in the teaching methods at the different levels of education. Thus, future teachers must be trained taking into account the current social, environmental and economic situation.

Education for sustainable development is associated with a change in educational approaches. For teachers – from the transfer of knowledge to the creation of conditions for active learning and gaining practical skills. For students – from passive learning of information to active search, critical comprehension and use in practice, to dialogue and action.

Teaching modelling should be part of the preparation of future primary school teachers, because the ability to build models of different types (visual, verbal and symbolic) is an important social skill and intellectual ability of a modern person. Developing and solving verbal problems with cultural, environmental

and economic content contributes to the education of the individual for the purposes of sustainable development.

One of the methods aimed at the implementation of the idea of sustainable development is the case method. This is due to the orientation of education to the development of personality, values and attitude to life, mastering the skills to work with information in the process of formation of professional competence.

The special character of the content and organization of work with the cases, that allow to implement the idea of sustainable development in preparation of future primary school teachers to teach mathematics, is reflected in the following principles: the principle of an underlying verbal arithmetic problem, the principle of poly-directional thematic working groups of students, and the principle of minimalism.

The conducted methodical work has shown that the means of the subject Mathematics Teaching Methodology can have a positive impact on the achievement of a number of key goals of education for sustainable development: to form general educational intellectual and practical skills, to master the subject content with a focus on the formation of attitudes and the development of critical thinking; to enhance economic literacy; to develop responsibility for the preservation of the natural and cultural environment.

References

Altshuller G., 2011, *Nayti ideyu: Vvedenie v TRIZ – teoriyu resheniya izobretatelskikh zadach* [*Find an Idea: Introduction to TSIT – the Theory of Solving Inventive Tasks*], Moscow: Alpina Publishers.

Arcavi A., 2003, The Role of Visual Representations in the Learning of Mathematics. *Educational Studies in Mathematics*, 52, 215-241.

Bartolini Bussi M.G., Mariotti M.A., 2008, Semiotic Mediation in the Mathematics Classroom: Artifacts and Signs After a Vygotskian Perspective, in *Handbook of International Research in Mathematics Education*, eds. L.D. English, D. Kirshner, Mahwah, NJ: Lawrence Erlbaum.

English L.D., Watters J.J., 2005, Mathematical Modelling with 9-Year-Olds, *Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education*, 2, 297-304.

Gadzaova S., 2014, Podgotovka studentov k osushchestvleniyu funktsionalnoy propedevtiki v nachalnom kurse matematiki sredstvami modelirovaniya [Preparing Students for the Implementation of the Functional Propaedeutics in the Introductory Course of Mathematics by Means of Modeling], *Problemy wczesnej edukacji. Issues in Early Education. Dziecko w świecie liczb i komputerów*, Część 1, 4(23), 77-84.

Gadzaova S., Muravyova H., Urban M., 2015, The Role of the Set of Educational Materials for Teaching Mathematics in Primary School in the Application of the Ideas of

Sustainable Development, *Pathways to the Future: Education for Sustainable Development: Proceedings of International Conference*, 129.

Galbraith P., Stillman G., 2001, Assumptions and Context: Pursuing Their Role in Modeling Activity, *Modeling and Mathematics Education*, 9, 300-310.

Giaquinto M., 2007, *Visual Thinking in Mathematics. An Epistemological Study*, Oxford: Oxford University Press.

Gladkikh I.V., 2005, Metodicheskie rekomendatsii po razrabotke uchebnykh keysov [Methodical Recommendations for Development of Educational Cases], *Vestnik of Saint Petersburg University*, 8(2), 169-194.

Gladkikh I.V., 2008, Keysy "bolshie" i "malenkie" ["Big" and "Small" Cases], *Vestnik of Saint Petersburg University*, 8(1), 156-159.

Goldin G.A., 1998, Representational Systems, Learning and Problem Solving in Mathematics, *Journal of Mathematical Behavior*, 17(2), 137-165.

Goldin G.A., 2002, Representation in Mathematical Learning and Problem Solving, in *Handbook of International Research in Mathematics Education*, ed. L.D. English, Mahwah, NJ: Lawrence Erlbaum.

Goldin G.A., Kaput, J.J., 1996, A Joint Perspective on the Idea of Representation in Learning and Doing Mathematics, in *Theories of Mathematical Learning*, eds. L. Steffe, P. Nesher, Mahwah, NJ: Lawrence Erlbaum.

Kostyuchenko N., Smolennikov D., 2016, Active Teaching Methods in Education for Sustainability as Applied in Good Practices of Local Communities, *Studia Periegetica*, 1(15), 145-149, https://wydawnictwo.wsb.pl/sites/www.wydawnictwo.wsb.pl/files/czasopisma-tresc/Studia P_15_net.pdf [access: 10.12.2016].

Lange J. de, 2006, Mathematical Literacy for Living from OECD-PISA Perspective, *Tsukuba Journal of Educational Study in Mathematics*, 25, 13-37.

Leenders M.R., Erskine J.A. , 1989, Case Research: The Case Writing Process, *Research and Publications Division: School of Business Administration*, Ontario: University of Western Ontario.

Lehrer R., Schauble L., 2003, Origins and Evolution of Model-Based Reasoning in Mathematics and Science, in *Beyond Constructivism: Models and Modeling Perspectives on Mathematics Problem Solving, Learning, and Teaching*, eds. R. Lesh, H.M. Doerr, Mahwah, NJ: Lawrence Erlbaum.

Littlewood J.E., 1953, *A Mathematician's Miscellany*, London: Methuen and Co.

Muravyova G.L., Urban M.A., 2016, *Matematika: uchebnoe posobie dla 2-go klassa* [*Mathematics: Textbook for Grade 2*]. Part 1, Minsk: National Institute of Education.

Natsionalnaya strategia ustoychivogo sotsialno-economicheskogo razvitia Respubliki Belarus na period do 2030 goda [The National Strategy for Sustainable Socio-Economic Development of the Republic of Belarus Until 2030], 2015, *Economic Bulletin of the Economic Research Institute of the Ministry of Economy of the Republic of Belarus*, 4(214), www.economy.gov.by/ru/macroeconomy/nacionalnaya-strategiya [access: 12.12.2016].

Reznik N.A., 2012, *Vizualnoe myshlenie v obuchenii. Metodicheskie osnovy obuchenia matematike s ispolzovaniem sredstv razvitia vizualnogo myshlenia* [*Visual Thinking in*

Education. Methodical Framework of Teaching Mathematics Using the Means for the Development of Visual Thinking], Saarbrucken: Lambert Academic Publishing.
Selvam M., Babu M., Raja M., 2006, Caselets Teaching in Business Education, *SMART Journal of Business Management Studies*, 2(2), 70-72.
Thomas G., 2011, A Typology for the Case Study in Social Science Following a Review of Definition, Discourse And Structure, *Qualitative Inquiry*, 17(6), 511-521.
Urban M., 2003, Obuchenie s pomoshchyu konkretnykh situatsiy [Training Through Specific Situations], *Pachatkovaya Shkola*, 2, 37-39.
Ustoychivoe razvitie: obshchestvo, obrazovanie, tekhnologia, ekonomika, ekologia [*Sustainable Development: Society, Education, Technology, Economy, Ecology*], 2011, Materials of the European Workshop, Minsk, http://minsk.mesi.ru/science/conf [access: 1.12.2016].
Woodside A., 2010, *Case Study Research: Theory, Methods and Practice*, Bingley: Emerald Group Publishing.

Przygotowanie przyszłych nauczycieli szkoły podstawowej do realizacji idei zrównoważonego rozwoju na lekcjach matematyki

Streszczenie. Podstawą przejścia do zrównoważonego rozwoju społeczeństwa jest włączenie idei zrównoważonego rozwoju do edukacji. Skuteczność edukacji na rzecz zrównoważonego rozwoju wymaga wdrażania przedmiotowych zagadnień we wszystkich kursach. W ramach wyższej edukacji pedagogicznej niezbędne jest zapewnienie studentom dostępu do wiedzy oraz umiejętności, które pozwolą im zarówno na włączanie zagadnień zrównoważonego rozwoju do nauczanych przedmiotów, jak i na opracowanie odpowiedniego naukowo-metodologicznego wsparcia. Na uniwersytetach białoruskich przygotowanie przyszłych nauczycieli szkół podstawowych do realizacji idei zrównoważonego rozwoju w nauczaniu matematyki odbywa się w trzech obszarach. Pierwszy związany jest z aktywnością społeczną jednostki i obejmuje rozwój intelektualny uczniów oraz nabywanie umiejętności praktycznych za pośrednictwem matematyki do samodzielnego funkcjonowania w społeczeństwie. Drugi to kształcenie umiejętności tworzenia treści zadań matematycznych, które mają rozwijać u dzieci stosunek emocjonalny oraz szacunek wobec środowiska naturalnego i kulturowego. Trzeci obszar metodologicznego przygotowania związany jest z kształtowaniem wiedzy ekonomicznej u dzieci. Wszystkie te obszary mogą być skutecznie rozwijane za pomocą studium przypadku jako metody nauczania studentów.

Słowa kluczowe: edukacja dla zrównoważonego rozwoju, metody nauczania matematyki, szkoła podstawowa, umiejętności modelujące, stadium przypadku