Pedagogues' insights about the organization of the development of functional mathematical literacy of students having moderate special educational needs in mainstream school

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Abstract: *The article deals with the insights of pedagogues about the importance of the development of functional mathematical literacy for students having moderate special educational needs, the possibilities of the improvement of the education process of mathematics in senior heterogeneous classrooms of mainstream schools, where students with moderate special educational needs learn integratedly, have been discussed. 275 pedagogues have participated in the research: 151 teachers of mathematics from mainstream schools and 124 pedagogues from the Lithuanian vocational training centres and vocational schools who according to programmes of vocational education educate young people having moderate and severe special educational needs.*

Keywords: *functional mathematical literacy, modelling of the system of education oriented towards the development of functional literacy, practical application of mathematical knowledge, students having moderate special educational needs, teaching (learning) paradigm and methods.*

1 Introduction

In recent several decades in the whole world many changes in social and education area have taken place. The main changes in the system of education are the alteration of legal attitudes of education; distinct transformation of classical education paradigm to more child-oriented education, respect for personality, acknowledgement of differences; implementation of the ideas of inclusive education in the systems of education of various countries. The ideas of inclusive education have expanded the spaces of education to various contexts (both formal and informal) of the system of education in order to ensure the use of all possible resources and effectively meet students'

needs. On the international level the UNO Convention of Children's Rights (1989), the Declaration of Salamanca (1994), the Convention of Dakar (2000) had especially big significance for the spread of the ideas of inclusive education, while in Lithuania – the Law on Education of the Republic of Lithuania – (1991) and recently published legal acts implementing the Law on the Amendment of the Law on Education of the Republic of Lithuania (2011), the Law on Social Integration of People with Disabilities (2005), Strategic Provisions for the Development of Education of the Republic of Lithuania (2003–2013) (cit. Ališauskas, Ališauskienė, Gerulaitis, Kaffemanienė, Melienė, Miltenienė, 2011). All the aforementioned documents emphasize the essential attitude related to education – ensuring equal possibilities for all members of the society (including people with disabilities, national minorities, representatives of different cultures. The mission of education in these documents is perceived as an assistance for a student in perceiving contemporary world, gaining the basics of literacy, cultural and social competence and becoming an independent, responsible person creating own and community life, while the mission of contemporary vocational training – the education of qualified specialists able to act independently, take decisions and compete in the labour market of the European Union.

After regaining of Independence in Lithuania creating the system of education and searching for the best possibilities to effectively educate children of various abilities and needs Lithuania has chosen multi-track system of education that suggests many various ways, education forms and institutions to educate persons having special educational needs (Aidukienė, Labinienė, 2003). In the Law on Education of the Republic of Lithuania (2007) it is indicated that students having special educational needs may use the possibility regulated by the laws on education of the Republic of Lithuania to choose the form of learning: complete integration (in mainstream classes of all types of schools – primary, basic, secondary mainstream schools, now also progymnasiums, gymnasiums, schools-kindergartens, boarding-schools, youth schools, children's socialization centres); partial integration (in special classes of all types of mainstream schools); education in special educational institution (special schools, education centres and other special educational institutions); education at home. Education at home is prescribed only in exceptional cases for a student who cannot attend school because of various health and socialization disorders. Recommended education forms depend on student's special educational needs – mild, moderate, severe and very severe, that are assessed in stated order by school commissions of child's welfare (until July 2011 – school commissions of special education) or by the specialists of Pedagogical Psychological Service orienting not so much towards developmental disorders but towards special educational needs conditioned by them (Ališauskas, Ališauskienė, Gerulaitis, Kaffemanienė, Melienė, Miltenienė, 2011). The degrees of special educational needs are assessed according to the criteria describing the ways of pedagogical assistance that are needed by a student to make

teaching efficient: application of content and ways of education (level of programme; education methods, pace, etc.); adaptation of educational environment; intensity and many-sidedness of specialists' assistance; needs for special means of education, etc. (Description of the procedure for the determination of groups and their special needs in the distribution of levels of pupils having special educational needs, 2011). The bigger is the number of criteria that describe the conditions necessary for students' education, the more complicated is the level of his/her special educational needs. In Strategic Provisions for the Development of Education of the Republic of Lithuania (2003–2013) it is indicated that children and youth with special needs have possibility to learn in schools of all types in educational environment favourable for them according to the programmes of formal and informal education.

The data of the monitoring of the education system of Lithuania show that in special educational institutions the number of students with special educational needs is annually decreasing, while the part of these students who study in mainstream schools is increasing. If in the school year of 1999–2000 students having special educational needs made up 8,5 per cent of all students of mainstream schools of Lithuania, in the school year of 2008–2009 children having special needs made up already over 10 per cent of all students of Lithuania (out of them 90 per cent learned in mainstream classes of mainstream schools together with peers, 1 per cent in special classes and 9 per cent in special schools), while in the school year of 2009–2010 in schools of Lithuania there already learned 11,6 per cent of children of school age having special educational needs (Education Management Information System (ŠVIS), 2010). According to the data of the Ministry of Education and Science the number of students having special educational needs in mainstream classes of mainstream schools is annually increasing, while the number of students choosing the form of education in special schools is decreasing. It conditions new changes in the organization of education of mainstream school. The idea that teaching and learning of students having special educational needs should be based on pragmatic and constructivistic approach gets more and more approval, in this approach education takes place through practical activity, not the amount of gained knowledge but the ability to apply this knowledge in practical activity, to orient in real-life and work situations becomes important. Applying active methods it is attempted to obtain the closest possible relation with reality, with real life, with problems of community and society. It increases students' learning motivation and their interest in learning process. Before that, during the decades in Lithuania in mainstream school much attention was paid to the development of academic knowledge, and less attention to the development of functional literacy. Systemic learning was too little related to student's future life, not oriented towards the being an adult. In main documents regulating education system of Lithuania it is indicated that the time has come to change this system.

Today it is difficult to adapt to constantly changing society if skills of problem solving are insufficiently well developed, if there is lack of knowledge, willingness to learn and improve, confidence in one's strengths. Classes of mathematics provide main knowledge and skills necessary for mathematical literacy. It also conditions new importance and new requirements for teaching and learning mathematics at school. Contemporary education theory and practice with regard to changing life requirements raise a task for teachers of mathematics to constantly review the contents of the subject, assess and reorient educational priorities, help each child to develop the most important and essential general abilities and value attitudes that will help in future to choose a profession, to find a place in a rapidly changing society, to successfully work and act in the society, to feel good and be happy (Baranauskienė, Tomėnienė, 2010; Tomėnienė, 2010, 2011). Undoubtedly it is very important in organizing the education of senior grade students having moderate special educational needs at school during prevocational period because in the report of the research "Meeting special educational needs: the experience of Lithuania in the context of foreign countries" (2011) it is indicated that not enough attention in mainstream school is paid to prevocational counselling and provision with information, for getting ready for independent living, vocational activity and the development of general and social skills. All this encourages changing the contents and process of teaching mathematics in the way it would become valuable and important for future learning, vocational activity and self-expression of a young person with disability. Thus collaboration between teachers working at schools and vocational schools becomes relevant. With this purpose the survey of pedagogues from Lithuanian mainstream schools and vocational training centres have been performed, and 275 pedagogues participated in it: 151 teachers of mathematics in mainstream schools and 124 teachers of professions and subjects from Lithuanian rehabilitation and vocational training centres who educate young people having moderate and severe special educational needs. It has been interesting to analyze the aspects of the organization of the development of functional mathematical literacy of students having moderate special educational needs **(research object)** in the prevocational period. Problematic **questions** – What are the insights of pedagogues about the organization of the development of functional mathematical literacy in senior classes of mainstream school? What didactic paradigms, methods, structure and dynamics of didactic process should be applied in a heterogeneous classroom where a student having moderate special educational needs learns?

Aim of the research – to reveal pedagogues' opinion about the possibilities of the organization of the development of functional mathematical literacy in mainstream schools for students having moderate special educational needs.

Sample of the research. Selecting the participants of the research the method of target sampling has been used. In the present case the sample group of the quantitative

research consisted of 275 pedagogues: 151 teachers of mathematics in mainstream schools and 124 teachers of professions and subjects from Lithuanian rehabilitation and vocational training centres who educate young people having moderate and severe special educational needs. In choosing the participants of the research the attention was not paid to their age and gender.

2 Methodology

Methods of the research – Analysis of scientific and methodical literature, questionnaire survey, quantitative data analysis. Statistical analysis (descriptive analysis of frequencies, arithmetical means (M), standard deviations (Sd)) of the data has been performed using programme packages of processing statistical information (Statistical Package for the Social Sciences) 17.0 and Microsoft Office Excel 2007.

Questionnaire written survey in the form of anonymous questionnaire meant for pedagogues of vocational training of people with disabilities has been chosen as the main method of the research. The questionnaire consists of three blocks: demographical block (data about the respondents) has been presented, the second block of questions is meant to assess actual level of mathematical literacy of young people with special needs studying in vocational training centres, their ability to apply mathematical knowledge in their practical and vocational activity, the third block presents the questions about the possibilities of the improvement of the process of mathematical education, of choosing the directions of activity and education during the period of prevocational training.

In the present article the obtained results of the research of the third block – pedagogues' insights about the possibilities of the improvement of the education process of mathematics in senior grades of mainstream schools in the context of the development of functional mathematical literacy of students having moderate special educational needs have been analyzed in more detail.

While creating the survey questionnaire the requirements set for the creation of questionnaire have been regarded: it has been reasonably, briefly and logically explained why the research is performed; the presented questions are concrete and the variants of the responses are understandable to make the respondents' efforts minimal. The questions of the third block of the questionnaire are of closed-type when it is necessary only to choose one of the presented answers or choose several answers in order to know pedagogues' personal opinion; at the end of each question the option "other" is indicated, which gives possibility for a pedagogue to express his/her own opinion.

3 Results of the research

Having reviewed the essential issues of mathematical literacy and its concept referring to the research of the scientists (Steen, 2004, Niss, 2003, Carss, 1997, Briggs, 2002, Gillman, 1999, Johnston, 1994, Manaster, 2001, Dudaitė, 2008) it has been noticed that one of the main elements is the applicability of mathematical knowledge in practical and real-life situations, the ability to solve the problems one faces. Literacy is not meant only for the people who are the best at mathematics.

The necessity of the change of the principal attitudes towards teaching (learning), the need to look at the preconditions and possibilities of individual's cognitive development and evolution from pragmatic constructivistic aspect encouraging to look for new ways of modelling harmonizing with the new system of education was accentuated by Dewey (1938, 2008), Bruner (1966, 1973), Vygotsky (1982), Kolb (1984), James (1995), Arends (1998), Jensen (1999), Piaget (2002), etc.

In UNESCO Policy Guidelines on Inclusion in Education (2010) it is emphasized that a student having special educational needs being educated together with peers has a possibility to take over their experience, to learn how to communicate, also creating conditions for his/her more advanced and skilful classmates to learn while teaching others, to develop positive attitudes towards people's differences, to form value attitudes acceptable to contemporary society (cit. Ališauskas, Ališauskienė, Gerulaitis, Kaffemanienė, Melienė, Miltenienė, 2011). Teacher's disposition to involve all students in learning process taking place in a classroom, to create conditions for everyone to be educated according to his/her possibilities, to raise adequate learning goals that are relevant for everyone, to choose suitable strategies of the evaluation and self-evaluation of achievements is also very important.

In literary sources it is indicated that the problems of meeting special educational needs in the context of inclusive school is often related to the problems of the adaptation of the contents of education, the selection of the methods of teaching and learning and the evaluation of academic achievements, in other words, the question of the quality of education in a heterogeneous group is raised. It is also approved by the data of the survey presented in the report of the research "Assessment of pedagogues' professional competence in the aspect (of the development of education) of children with special needs" (2003). It is indicated there that every fourth pedagogue in Lithuania experiences difficulties in choosing appropriate methods and ways of education, in differentiating education in a group or class, in strengthening students' learning motivation. King-Sears (2008) states that pedagogues may face certain problems because of the attitude that they must teach the same thing to all students at the same time, also because of the fact that applied teaching methods are not suitable for all students and their achievements are not as expected. Speaking about educating students of different abilities together, most often, according to the author, the mistake is made

about two things: it is supposed that children having learning disabilities are unable to learn the same thing as their peers do; and that teachers must teach everything what is previewed in programmes despite of student's success. Denying these attitudes King-Sears (2008, cit. Ališauskas, Ališauskienė, Gerulaitis, Kaffemanienė, Melienė, Miltenienė, 2011) states that children having learning difficulties are able to learn the same thing as their peers do. The most important thing is that appropriate methods and techniques should be applied; some students need special, extraordinary learning that is not always available in a mainstream classroom; the criteria and ways of evaluation and the adaptation of the contents of education is necessary.

According to Štitilienė (1995), teaching mathematics help students having special educational needs to adapt in the society, to get ready for life. This teaching forms and corrects such forms of intellectual activity as comparison, analysis, synthesis, creates conditions for the correction of memory and the development of attention, thinking and other psychical functions. Therefore, the teacher of mathematics needs to apply various ways and methods of teaching mathematics employing various didactic material and visual means, differentiating and individualizing work. Teachers working with children having special needs should not only notice the abilities of their students but also with regard to them individualize teaching process, in case of need, change the contents of education, choose necessary material and present it using appropriate teaching methods. Children having special needs learn in mainstream classes, therefore, it requires teacher's extraordinary ability to differentiate and individualize teaching.

Researches (Farrel, Dyson, Hutcheson, Gallanaugh, 2007; Meijer, 2001; Mitchell, 2008; Nind and Wearmouth, 2006; cit. Ališauskas, Ališauskienė, Gerulaitis, Kaffemanienė, Melienė, Miltenienė, 2011, p. 31) show that there are several factors and strategies conditioning the success of integration: cooperative learning and peer support; c*ollaborative teaching* and joint problem solving in a team; heterogeneous grouping and adapted teaching (in the sense of the contents and organization of education) allowing successful differentiation of education; teachers' in-service training and rendering assistance to them; close relations with parents.

The aforementioned strategies should be flexible in the sense of time, place and form. Essential education strategies (e. g., cooperative learning, activity-based learning, peer support, etc.) show the importance of methods that meet different needs. Generalizing it is possible to state that the development of mathematical literacy in mainstream schools gives all students the possibility to know the subject of mathematics, its importance in life, the concepts, the ability to apply knowledge in practice is improved, mathematical skills are trained. It is especially relevant educating students having moderate special educational needs. Teacher should help students to perceive their actual interests, to reveal the main needs related to future plans, everyday life and then organize teaching meeting these interests and needs. It is

important to aim at student's active participation in the process of education and self-assessment of achievements, independent controlling of one's own possibilities and activity, students' involvement in solving social, practical and other problems. Thus, inclusive education requires shift of attention from how all students could attain the same level to how every student could attain higher level.

By the research it has been attempted to reveal pedagogues' insights (attitude) about the possibilities of the improvement of the development of functional mathematical literacy of students having moderate special educational needs in senior grades of mainstream school. Svetlana Tamutytė, the master student of the Faculty of Social Welfare and Disability Studies, helped to interview teachers of mathematics of mainstream schools according to the adapted questionnaire prepared by Laima Tomėnienė, the doctoral student of Šiauliai University, for pedagogues of vocational training centres.

The analysis of the answers to the questions of the demographical block has shown that the majority of the respondents are women, because 82,2 % of women and 17,8 % of men participated in the research. Pedagogues' age is very different: mainly the pedagogues of vocational training centres and mainstream schools of the age of 41–60 years of age participated in the survey (83% of all the respondents). The mean of the duration of pedagogical work experience of the pedagogues of vocational training centres who participated in the research is 18 years, while the mean of the duration of work in general is 22 years. Among the teachers of mathematics working in mainstream schools the teachers with pedagogical work experience of 21–30 years (38,9%) and 31–40 years (33,6%) are predominant. The majority of the pedagogues from vocational training centres (N = 110) and mainstream schools (N = 144) have higher education, 7% of the respondents have college education, 6% of the pedagogues did not respond to this question. Almost all the respondents (96%) have pedagogical education, however, 10 pedagogues from vocational training centres do not have this kind of education. Out of 265 respondents having pedagogical education 17,1% have the qualification category of teacher, 38,6% – senior teacher, 40% – teacher methodologist and 3,7% (9 pedagogues of mainstream schools and 2 pedagogues of vocational training centres) – expert, the number of pedagogues who do not have the qualification category was very small (0,6 %). Most often it is young specialists who had recently started working at school. More than a half of the pedagogues working in vocational training centres who participated in the research (56,2%) in vocational training centres and vocational schools teach the theory of speciality and practical teaching of speciality; 29,8 % of the pedagogues teach the theory of speciality or practical teaching of speciality; 13,7% teach general cultural subjects. All of the pedagogues working in mainstream schools teach the subject of mathematics in senior grades, where students having moderate and severe special educational needs integratedly learn. Teachers' education and qualification show their

subject and professional competence, their preparedness to analyze changing aims and contents of mathematical education in basic school, also their independence planning their work with all students and particularly with students having moderate special educational needs, improving their qualification. The results of the research show that the majority of the participants of the research have big experience of work with young people having moderate special educational needs, therefore, their answers are quite important and valuable.

Analyzing the questions about the improvement of the process of education it has been interesting in what way, according to the pedagogues, students having moderate special educational needs succeed the most at learning, what forms of activity would be most useful to be applied in the classes of mathematics so that the majority of students having moderate special educational needs would successfully participate in the activity of the lesson, willingly learn and achieve positive results of education. The respondents had to choose one out of possible answers. Respective score of measurement: "Almost for everyone"– 5, "For the majority"– 4, "For almost a half"– 3, "For less than a half"– 2, "For some students"– 1. The results of the research have been presented in Table 1.

Table 1: Students' ability to successfully work in lessons (N = 275)

Ability, strategy of teaching or learning	**Teachers of mathematics of mainstream schools**		**Pedagogues of vocational training centres**	
	Mean	**Std. deviation**	**Mean**	**Std. deviation**
To work productively during the main part of the lesson	2,71	0,97	2,55	1,14
To finish tasks assigned to him/her in the time of the lesson	2,52	0,76	2,54	1,20
To work individually	2,17	0,91	2,52	1,13
To work in a group collaborating with other children	3,04	0,72	2,97	0,74
To work in a pair with peer's support	3,02	0,70	2,97	0,74
To work individually	1,84	0,83	2,07	1,08
To do their homework	2,33	0,97	1,98	0,97

The pedagogues of vocational training centres and mainstream schools state that one of the most suitable learning strategies in the lessons of mathematics developing mathematical literacy of students having moderate special educational needs is to apply *work in a group collaborating with other children* (M = 3,04 /attitude of the teachers of mathematics/ and M = 2,97 /attitude of the pedagogues of vocational training centres/), and *work in a pair with peer's support* (M = 3,02 /attitude of the teachers of mathematics/ and M = 2,97 /attitude of the pedagogues of vocational

training centres/). The respondents pointed out that applying these learning strategies more than a half of students having special educational needs are able to successfully work in a lesson. It is possible to make a presupposition that learning in groups and pairs students get possibility to collaborate, to discuss with friends, to share works and activities among themselves, to experiment and express their ideas with more courage, to learn form the others, to present arguments. It is also approved by the results of previously performed researches. Ambrukaitis, Ruškus (2002), Dabrišienė, Narkevičienė (2002) and other educologists especially emphasize the importance of cooperative learning educating children having special educational needs. According to them working in groups raising of problematic questions, verbalization, reflective thinking, mutual support, individual work are encouraged. In the opinion of Teresevičienė, Gedvilienė (1999), learning in heterogeneous groups and pairs encourages the development of both capable children and of those having poorer abilities.

More than a half of students experience difficulties in working productively during the major part of the lessons *individually* even being often helped by teachers (M = 2,17 /attitude of the teachers of mathematics/ and M = 2,52 /attitude of the pedagogues of vocational training centres/). Such students often do not trust in their abilities, they want teacher's acceptance and explanation. The students experience the most difficulties in working *independently* (M = 1,84 /attitude of the teachers of mathematics/ and M = 2,07 (attitude of the pedagogues of vocational training centres)). Such activity for students having SEN is complicated enough. 93% of the respondents pointed out that less than a half or some students of senior grades and especially learning in vocational training centres regularly do their homework. The results of Sd deviation show that the pedagogues evaluated this question very differently.

The question for the teachers of mathematics "Do you agree that in the lessons of mathematics…" was followed by the statements and the pedagogues had to agree or disagree with them. With this question it was aimed to find out whether in the lessons of mathematics the possibilities are created for students having moderate special educational needs to gain social, general, vocational skills, what senior grade students having moderate special educational needs should be taught. Sd deviation shows that the pedagogues did not assess this question unanimously. The data show that the pedagogues *agree* with the following statements: it is important to teach students to reason and discuss; all students should do quite many exercises forming skills; it is necessary for students themselves to try, explore and discover as much as possible.

The pedagogues *partially agree* with the statements that say: students during the lessons of mathematics gain enough social skills; the conditions are created for students to gain work skills; the possibility to express oneself in practical activity is given.

The interest has been shown in the pedagogues' opinion about the topics of mathematics the knowledge of which is necessary in real-life situations, practical activity.

All the respondents pointed out that in helping students having special educational needs get ready for life practical purposefulness of teaching is very important. According to the teachers of mathematics the most necessary topic in real-life situations is *natural numbers (M = 2,77)*. The pedagogues also think that among the most necessary topics are *basics of economics (M = 2,38), multiplication and division of natural numbers (M = 2,36), angle, triangle and rectangle (M =2,35), areas (M = 2,29)*. In order to learn a profession, according to the majority (80–98%) of the pedagogues of vocational training centres, knowledge and practical abilities of four main mathematical topics *(Natural numbers. Addition, subtraction, multiplication and division of natural numbers; Fractional numbers. Operations with simple and decimal fractions; Primary geometrical concepts, calculation of perimeter and area; Basics of economics)* are the most necessary.

The opinions of the teachers of mathematics and profession coincided discussing the least necessary topics under doubt and discussion. According to the pedagogues the least necessary topics under doubt and discussion are the following: *Trigonometric expressions and their manipulation* (77,4% of the answers), *Progressions, Limit of function and differential calculus* (77% of the answers each), *Axioms of stereometry* (76% of the answers), *Exponentiation with rational exponents* (75% of the answers), *Functions and Square equations* (72% of the answers). The analysis of literary sources, General Programmes (2008), Recommendations of the application of general programmes of basic education for education of students with special needs having low and very low intellectual abilities (2010) shows that in contemporary context it is much more important to develop the ability to use mathematics in various situations than to teach how to perform certain complicated theories or operations that are actually applied by students only in the lessons of mathematics and are easily forgotten. Sd deviation shows that the pedagogues very unanimously evaluate the necessity under doubt and discussion of these topics for mathematical education of students having moderate special educational needs.

The third block presents the questions about the necessity and possibilities of the improvement of the process of mathematical education at school, domination of educational paradigms in teaching mathematics for students having moderate special educational needs, choosing methods during prevocational training. The statements have been chosen referring to adapted comparison of classes and activities that are traditional and based on the principles of constructivism and pragmatism by Brooks J. G., Brooks M. G. (1999) (cit. Jurašaitė-Harbison, 2008), and educational paradigms of teaching and learning presented in scientific literature. The opinions of the pedagogues from mainstream schools and vocational training centres coincided discussing the relation of teaching and learning paradigms educating students having special educational needs. The majority of the respondents have indicated that the most important educational paradigm that should dominate in working with

students having special educational needs is the paradigm of learning. According to the pedagogues, teaching during the lessons of mathematics should be based on students' experience, environment and learning "everywhere and always" should be in the first place and various sources of information and means of learning should be considered important (M = 6,14 /attitude of the teachers of mathematics/ and M = 6,42 /attitude of the pedagogues of vocational training centres/), teacher should be a teaching adviser (counsellor), specialist, adviser (*M = 6,22* /attitude of the teachers of mathematics/ and M = 5,28 /attitude of the pedagogues of vocational training centres/, next to traditional teaching methods teacher should use individual and group ways of solving, non-traditional methods M = 5,20 /attitude of the teachers of mathematics/ and M = 4,59 /attitude of the pedagogues of vocational training centres/). In pedagogues' opinion, teachers and specialists should the least follow such educational paradigms as *only teacher is the active participant who has a goal and acts according to it (M = 2,91* /attitude of the teachers of mathematics/ and *M = 2,94* /attitude of the pedagogues of vocational training centres/), *teacher in classes often uses explanation, questioning, writing, text reading, lecture, demonstration (M = 3,58* /attitude of the teachers of mathematics/ and *M = 3,78* /attitude of the pedagogues of vocational training centres/). Sd deviation shows that pedagogues unanimously evaluate the following educational paradigms: a student is a passive receptor of information; teacher is in the process of the transmission of facts and abilities, their memorization and reproduction. The pedagogues' responses show that still the following opinion is predominant that students having special educational needs are unable to appropriately formulate learning goals, a teacher should form the lessons and teaching goals, because only he/she is responsible for what his/her students will learn *(M = 4,19)*.

Summing up it is possible to make a precondition that pedagogues agree teaching and learning should be based on pragmatic and constructivistic approach, therefore, it is important to be interested in the peculiarities of student's development, his/her thinking abilities, gained experience, learning motivation, practical application of mathematical knowledge modelling various real-life situations in the lessons as often as possible. It is emphasized that learning is an active two-sided process the aim of which is not to transmit and receive information but improve student's individual perception through active practical performance.

From the answers to the question "What in your opinion is important individualizing the programme of mathematical education?" asked to the pedagogues it has been aimed to find out the most important aspects of individualized programme of mathematical education. The respondents could choose one of the possible answers. Respective score of measurement: "Very important"– 3, "Important"– 2, "Under doubt"– 1 point. The results of the research have been presented in Table 2.

Table 2: The aspects of individualizing the programme of mathematical education (N = 275)

Aspects of individualization	Teachers of mathematics of mainstream schools		Pedagogues of vocational training centres	
	Mean	Std. deviation	Mean	Std. deviation
Choosing the pace of learning	2,34	0,54	2,33	0,59
Foreseeing implementable goals and aspirations	2,66	0,47	2,49	0,53
Application of suitable learning (cognitive) strategies, teaching to apply	2,68	0,47	2,39	0,55
Foreseeing of possibilities of the realization of individual needs	2,45	0,50	2,42	0,56
Planning activities in the lesson developing collaboration	2,08	0,47	2,35	0,57
Involvement of interested persons (student, parents, specialists) in planning	1,95	0,56	2,18	0,69
Assessment and record of student's progress	2,22	0,42	2,37	0,53
Individualized assessment and feedback	2,55	0,50	2,48	0,55
Harmony between teaching and safe environment	2,22	0,44	2,45	0,58

In the table it is clearly seen that the most important 3 aspects, according to the teachers of mathematics, necessary individualizing the programmes of mathematical education are *application of suitable learning (cognitive) strategies, teaching to apply (M = 2,68), foreseeing implementable goals and aspirations (M = 2,66) and individualized assessment and feedback (M = 2,55)*. According to the pedagogues of vocational training centres the following 3 aspects individualizing the programmes of mathematical education are the most important: *foreseeing implementable goals and aspirations (M = 2,49), individualized assessment and feedback (M = 2,48) application of suitable learning (cognitive) strategies, teaching to apply (M = 2,39)*. Consequently, the same aspects have been mentioned, only the order of priority was a little different. The most questionable criterion, according to the teachers of mathematics, is *Involvement of interested persons (parents, specialists) in planning (M = 1,95)*. However, according to Ališauskas, Ališauskienė, Gerulaitis, Kaffemanienė, Melienė, Miltenienė (2011) parents' role in educating students with special educational needs is very important, sometimes even decisive, therefore, this aspect should not be underestimated.

In the respondents' opinion the individualization and differentiation of teaching, application of teaching and learning methods should help to develop general abilities of students having special educational needs, their positive attitude to competently use knowledge and skills in personal, professional and social life. The statistical data

analysis have revealed the pedagogues' opinion that showed that it is the most expedient next to traditional methods to choose *active methods (M=2,34) and methods combining various activities (M=2.29)*, that help students gain knowledge, abilities and skills, train aptitudes, from significant social attitudes. All teaching methods individualizing the programme of mathematics for students having special needs in mainstream school are assessed as necessary because the scores vary from 1,80 to 2,24. Sd deviation shows that the pedagogues' opinion on the questions of the application of methods is not very unanimous. In scientific, methodical literature it is pointed out that under contemporary conditions teaching methods should not only help to provide thorough knowledge, to form practical abilities and skills but also to teach how to independently gain knowledge, to teach how to interpret the obtained knowledge, to solve concrete problematic situations referring to it. Therefore, next to traditional methods new modern teaching and learning methods should appear, working with which the role of students and a teacher essentially changes. It has also been proved by the research by Ambrukaitis, Ruškus (2002), that showed that in the reality of the education of students having special needs it is necessary to speak about new teaching methods that can ensure the quality of the education of students having special needs, because in a contemporary classroom students with different academic abilities, different possibilities of activity and different educational needs meet. The following situation is created when a teacher during a short time of a lesson has to meet different individual needs.

The analysis of the answers to the questions "What teaching and learning methods in your opinion encourage students to get actively involved in the process of education during the lessons of mathematics?" has shown that *the method of solutions (M = 2,98), puzzle in certain succession (M = 2,96), patchwork method (M = 2,91), peer support (M = 2,91)* encourage students to get actively involved in the process of education during the lessons of mathematics the most. Sd deviation shows that the pedagogues evaluating these statements were unanimous. The pedagogues of mainstream schools and vocational training centres distinguished three things that according to them are needed for students to be good at mathematics: it is necessary to understand how mathematics is used in real life (71,7%); to think consistently and logically (69,9%); to understand the concepts, principles and regularities of mathematics (63,7%). In generalizing the results of the research the presupposition can be made that in order for students having special educational needs to understand how mathematics is used in real life, to understand the concepts, principles and regularities of mathematics during the lessons it is necessary to use various teaching and learning methods, especially the active methods.

4 Conclusions

1. The results of the research have shown that the directions of the development of mathematical literacy of students having moderate special educational needs should be oriented towards a new teaching paradigm when a student is an active centre of the learning process. The paradigm of learning should essentially change the aims of education, the relation between an educator and a student, methods, educational and learning environment.
2. Teaching and learning mathematics should be based in pragmatic and constructivistic approach, refer to close relations with the real world in order to encourage students to seek explanations and discuss, to solve problems personally relevant to them. In the process of education more attention should be paid to the formation of the abilities of all activity areas of mathematics showing practical applicability of mathematical knowledge and developing general, social, life and vocational skills.
3. It has been noticed that the majority of young people having special educational needs during the lessons are the best at learning when working in a group and collaborating with other classmates. Cooperative learning, according to the pedagogues, encourages students to work together and it in itself is a step towards the realization of the idea of inclusive education. However, referring to the analysis of scientific literature it is necessary to point out that to make cooperative learning successful a teacher should create such conditions where every student would take responsibility, support each other, share resources and information, be able to listen, get constructive feedback, be able to constructively solve disputes, to listen to the other's opinion.
4. Individualizing the programme of mathematical education the application of suitable teaching strategy, foreseeing of implementable aims and aspirations, individualized assessment are important. It is also the most expedient to choose active methods and methods combining various activities stimulating student's learning motivation and helping a young person to get ready for life and vocational education.

5 Discussion

During all the period of the reorganization of special education it has been investigated how students' special educational needs are met, especially in mainstream schools. The integration of students having special educational needs into mainstream schools and other institutions is a complicated process, therefore, quite many researchers have been performed that analyze conceptual ideas of integration, values, concrete phenomena of integrated education, pedagogues' attitudes and competences, pos-

sibilities of the reorganization of teachers' and other specialists' collaboration with students and their parents, the contents and process of education; the search for the facts revealing advantages and disadvantages of certain forms of education (integrated and special education), etc. (Ališauskas, Ališauskienė, Gerulaitis, Kaffemanienė, Melienė, Miltenienė, 2011). According to the data of Kaffemanienė (2005), although it is attempted to individualize teaching of students having special educational needs, however, it is too little oriented towards a child in general learning activity of the classroom, too few pedagogical contacts are devoted to a special child, it is too little oriented towards the initiation of a productive interaction with a student factually separating him/her from a classroom.

Although there are constant discussions about systemic changes in education ensuring equal opportunities of education, the suitability of the forms and ways of education of students having special educational needs and the possibilities of development, however, only now more extensive discussions are starting about the creation of the model of education of senior grade students having moderate special educational needs integratedly learning in mainstream school oriented towards practice and the functionality of knowledge; the adaptation of the contents of education when not knowledge but practical ability to apply possessed knowledge in real-life situations and solving problems becomes the main factor of the programme of the subject (in this case mathematics). The necessity appears to analyze the development of functional mathematical literacy of students having special educational needs in the system of pragmatic education, oriented towards a person as an active social individual, towards his/her interests, needs, experience and natural interaction with environment, child's social culture, the context of everyday life, self-expression and practice. The development of mathematical literacy, foreseeing its place in the process of education and the search and revelation of the ways of its improvement, realization and stimulation is a relevant pedagogical problem. Therefore, more thorough scientific research in this area is to be encouraged and necessary.

6 Literature

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