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## Support to Pupils with Learning Difficulties in Mathematics

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### Abstract

In this paper we present a model of assistance to pupils with learning difficulties in mathematics - *Implementation of modifications for pupils with learning difficulties in mathematics* (hereinafter – the model LDMAT) and LDMAT model's contribution to the teachers' competence to implement the support measures to pupils with learning difficulties in terms of the empirical study. The conceptual platform of the model LDMAT is based on the following principles: *giving sense to mathematical knowledge, instruction as mutual activity of pupils and teachers, the principle of participation*. The results of the study have shown that LDMAT model's contribution to the qualification of teachers to assist pupils with learning difficulties is very positive and represents a significant contribution to the improvement of teaching practices in overcoming learning difficulties in mathematics. Among the teachers, the model LDMAT was evaluated the highest in the field of selection, planning and use of appropriate didactic tools; they also highlighted the key factors for raising pupils' learning achievements: an individualized approach, promotion of the use of multi-sensory learning, timely support, cooperation with parents, encouragement for continuous work, discussion between teachers, pupils and parents, early involvement of pupils and parents in the preparation of the assistance plan, encouraging pupils to self-learning, etc.

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### 1. Introduction

Teacher's support to pupils with learning difficulties in mathematics is closely associated with his views and conceptions of the importance of certain mathematical contents as well as with his didactic and methodical skills to work with pupils with learning difficulties, with the understanding of his and pupil's role in the classroom. In order to implement assistance measures to pupils with learning difficulties in mathematics we have created a model

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*Implementation of modifications for pupils with learning difficulties in mathematics - model LDMAT* (Žakelj, 2012). The conceptual starting point of the model is based on the findings that the anxiety of pupils is caused by five factors (Shieelda, 2005, v: Kavkler 2010): pupils' and teachers' views on mathematics, curriculum, teaching strategies, classroom culture and assessment. With respect to these findings, the conceptual platform of the model LDMAT (Žakelj, 2012) is thus based on the following principles:

- *making sense of mathematical knowledge* as a consideration about which mathematical concepts or procedures are necessary that every pupil acquire them, and how to proceed if a pupil doesn't achieve certain goals and contents;
- instruction as mutual activity of pupils and teachers based on mutual liability;
- *the principle of participation* signifies a joint creation of education and a joint creation of mathematics and to respect pupils' cognitive, social and emotional needs through this process. In practice joint creation of mathematics means to express mathematical thoughts, to express knowledge and understanding of mathematical concepts, procedures and relationships among them. Furthermore, joint creation signifies also taking into consideration the pupils' needs for social and emotional aspects.

Specific areas of the model LDMAT are defined in two key substantive pillars: the first defines the elements of a *supportive and safe (learning) environment*, and the other provides *methodical steps for implementation of adjustments to pupils with learning difficulties in mathematics. Stimulating and safe learning environment* is based on constructive cooperation of pupils, professional staff and parents. This is an environment where all pupils have the opportunity and ability to co-create math lessons. Stimulating and safe learning environment is an environment that co-create professionals who have extensive knowledge of cognitive, social and emotional characteristics of pupils, who are familiar with the characteristics of pupils with learning difficulties and with the approaches for the implementation of adaptations for pupils with learning difficulties as well, who are guided by the principle of participation, the involvement of all pupils in class. Meaningful participation is a fundamental experience that we all need for living in this world. Čačinovič Vogrinčič (2008) and Šugman Bohinc (2011) note in their researches that the experience of cooperation is more efficient and more beautiful path to gain knowledge as it is a competition of all against all. The concept of co-creation of learning and support in the working process greatly changes the usual way of assisting pupils with learning difficulties. *Methodical steps of the model LDMAT* are circularly connected, and they spirally upgrade. Under the methodical steps we understand: continuous and systematic monitoring of pupil's progress (diagnostic, formative, summative), identification of learning difficulties, planning and implementation of strategies/measures of assistance, the reflection of the teacher and pupil, the evaluation of pupil's progress, and the evaluation of the effectiveness of assistance. The cycle spirally upgrades and continues. While planning activities within classes we also involve pupils, we take into consideration strong areas of individual pupils, their interests and motivation styles. We plan the role of school counselling service and parents' participation. Within the elements of planning didactic units from the perspective of learning difficulties treatment we determine the following: psychological aspect (characteristic of pupils, motivation ...); general and operational objectives of the didactic unit (level of necessity of particular aims and contents from the perspective of providing help to pupils with learning difficulties); contents (extent, content depth); necessary prior knowledge for the acquisition of new objectives and contents (level of necessity for particular objectives and contents from the perspective of assistance to pupils with learning difficulties); ways of indentifying learning difficulties; assistance measures in order to reach objectives in case of possible difficulties (adjusted didactic approaches, didactic materials, help provided by the school supportive service); monitoring pupils advancement (diagnostically, formatively, sumatively); the ways of producing and applying didactic requisites/materials (the purpose of didactic requisites; who produces didactic requisites/materials; when, what for and for how long pupils use the requisites ...); home works (extent, purpose, types of home works; home works as a means of the promotion of independence, creativity, responsibility; home works as the tool for the promotion of positive attitude to school, to knowledge, to school obligations); ways of pupils' inclusion into joint creation of instruction; reflexion of teachers and pupils (questions, possible guideline elements for records). For the effective implementation of the model UTMAT you need to strictly implement all the steps and support measures. Two most important conceptual characteristics of the model are *progressivity* and *flexibility*. Learning and teaching, that follow the stages of cognitive development, represent the transition from specific representations of concepts to abstract conceptualization. The key to successful acquisition of mathematical concepts is the *representations of concepts* which can be specific, graphic, symbolic or abstract. Chapman (2001, in Hodnik Čadež, 2003) emphasizes that representations allow pupils to communicate in mathematical way, to model and interpret real, social and mathematical context, and to explore and interpret the

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