



## PEDAGOGICAL SKILLS AND (E-)TEACHING - THE EXAMPLE OF MATHEMATICS AND READING

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### Abstract:

Problems faced by students with learning difficulties vary considerably for each student per subject and per educational level, having a common distinctive feature: they relate to areas in the handling of mathematical calculations and in the production of written speech. This brief report emphasises pedagogical skills, techniques and behaviour management as a cross-learning process in mathematics and reading in classroom. The paper can provide highlights in (e-)teaching through the example of mathematics and reading.

**Keywords:** learning difficulties, reading, mathematics, (e-)teaching, pedagogical skills, educational intervention

### 1. Introduction

Students with Learning Difficulties (Wong, 2004) and Mathematics Learning Disabilities (Rivera, 1997) have a dead end in educational practice. Their knowledge is fragmentary and they do not have problem-solving and school-processing strategies, so the risk of school marginalisation is visible. Learning Disabilities by definition refer to deficits in one or more of several domains, including reading disabilities, mathematical disabilities, and disabilities of written expression. Each type of Learning Disabilities is characterized by distinct definitional and diagnostic issues, as well as issues associated with heterogeneity (Lyon et al., 2003).

In mathematics, according to Ginsburg (1997), researchers should consider such factors as the adequacy of classroom instruction, the availability in children of informal knowledge, the role of motivation, the effects of specific interventions, the role and operation of different cognitive processes in constructing mathematical understanding,

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children's difficulties across different areas of mathematics and the development of children's thinking throughout the school years.

As the education and training of teachers has an important role in ensuring quality of learning specially for the children with special needs, the purpose of this brief review is to develop important pedagogical skills in (e-)teaching through the example of mathematics and reading as a cross-learning path (Gogaki & Ioannidi, 2018) and to encourage the participation and progress of students with special needs.

## 2. Learning difficulties and Mathematics Learning Disabilities

Generally, *“special education, or special needs education, is the practice of educating students with special needs in a way that addresses their individual differences and needs. The term “special education” refers specifically to students with learning disabilities, mental conditions, and other disabling conditions”* (<https://www.disabled-world.com/disability/education/special/>). Particularly, learning difficulties are a condition that exists and occurs in the individual throughout his or her life. It is very likely that individuals with learning difficulties have low self-esteem, set low goals, face under-performance and underemployment, do not have enough friends and may later encounter problems with the law due to delinquent behaviour (Tzivinikou, 2015). According to bibliographical data (Panteliadou & Patsiodimos, 2007/ Panteliadou & Antoniou, 2008/ Triga-Mertika, 2010/ Lyon et al., 2001/ Miles & Miles, 2006/ Lenhard & Lenhard, 2013):

- The problems faced by students with learning disabilities vary considerably for each student per subject and per educational level. However, they bear a common distinctive feature, relating to areas in the handling of written speech (reading, writing) and mathematical calculations.
- Specifically, problems of students with learning difficulties in mathematics are related to deficits:
  - Visual perception, e.g. does not complete the exercises of a page, reads the wrong multi-digit numbers, does not correctly distinguish coins, finds it difficult to interpret and manipulate mathematical symbols, distinguishes shapes and sizes, constructs and interprets graphs, finds it difficult to write fractional numbers, etc.
  - Acoustics, e.g. difficulty in oral exercises, in solving oral problems, confuses terms that look like phonological.
  - Thin mobility, e.g. writes too slowly, can not adjust the size of digits in the available space.
  - Memory, e.g. can not easily retain new mathematical data, finds it difficult to solve problems and exercises with many stages, finds it difficult to tell the time.
  - Speech, e.g. has difficulties in understanding mathematical terms, in using speech in mathematical terms.
  - Abstract reasoning, e.g. it is difficult to understand mathematical symbols, to solve oral problems, to compare sizes and quantities, to convert linguistic or numerical information into equations.

- However, it is a fact that any shortages of pupils with learning difficulties in mathematics are influenced not only by cognitive factors but also by the learning experiences provided by teachers.
- Similarly, with regard to reading decoding difficulties, i.e. in the process of identifying and handling the alphabetical code, the most frequent problems are characterised by incomplete phonological processing and in particular difficulty in handling voices, e.g. analysis, removal and production of rhyme, letter-to-letter editing decoding, many errors in substitutions, omissions and contrasts of letters, difficulties in decoding words with symphonic complexes, limited visual vocabulary, replacements of words by others that may be neither conceptually nor morphologically related to the outline of the word, etc. The difficulty of reading decoding affects the readability and therefore the extraction of meaning of the text, resulting in generalized reading difficulty and inability to read.
- In total, problems of students with learning difficulties are related to deficits, such as:
  - Deficit in the level of fluency and decoding in terms of reading decoding, e.g. reads slowly and has difficulty, has difficulty handling voices, often makes anti-transfers, substitutions, omissions, additions of letters and syllables, cannot easily decode clusters, ligatures and combinations, replaces similar voice words, makes errors in decoding unknown words, etc.
  - Deficit in reading comprehension, e.g. difficulty in understanding information presented directly and clearly in the text, finds it difficult to draw conclusions, cannot distinguish important information from insignificant information, finds it difficult to organise information in the text, does not use effective strategies in understanding, does not distinguish the central idea, is unable to form predictions and assumptions about content and cannot relate new knowledge to existing knowledge, etc.
- Overall, school difficulties concern problems in learning, performance and behaviour with multifactorial interpretation through cognitive, emotional, medical and psychosocial dimensions and a two-way relationship of biological and environmental authorities.

### **3. Pedagogical skills and educational intervention**

According to Heward (2011), numerical logic and calculations often pose problems for students with learning disabilities. Indicative support strategies for students with learning disabilities are as follows (Polychroni, 2007) in (e-)teaching and can be used in combination with deficiencies in written expression and underperformance in mathematics, such as:

- a profile review of the previous course,
- recording in the table of the most important words of the course,
- use of polysensitivity methods,
- repetition of information and instructions,

- correction based on content and not errors,
- more time to copy from the table,
- more time to organize ideas before free writing,
- use of clean worksheets, with the obvious signalling of specific information and the distinction of the most important points.

At the same time, at secondary level we can emphasize learning and study strategies, organisational problem-solving techniques, memory aids, so that students can help read a text, retain information when reading and write notes during delivery (Confrey & Kazak, 2006).

In addition, cognitively oriented programmes encourage and promote learning activities and experiences, which help to develop thinking skills by treating the child as an active pupil. Such programs are mostly effective in children at risk for school difficulties. The early intervention contributes to the cognitive and social development of children with developmental disorders and, in addition, helps to avoid other problems that accompany the initial difficulty (Nanou & Anagnostopoulou 2001).

According to a holistic intervention, measures are necessary, such as (Kourkoutas, 2014):

- Search for the causes through the symptom and attempt to address and modify the behavior.
- To carry out the design of psychosocial and academic intervention based on reasoning, needs and possibilities in all areas of the child and the family.
- Intervention should take place through a stable and positive interpersonal relationship.
- To design and provide, if necessary, a personalised programme of academic and psychosocial support.
- Offer family support through counselling.
- The acceptance of the teacher as well as his attitude is important, as through his attitude and acceptance or not, the feelings and attitudes of the other children are affected.
- Appropriate techniques should be used by teachers so that there is a climate of acceptance, communication, and proper interaction between all children with learning difficulties or not.
- It is appropriate to approach the child with subtlety, sensitivity, and discretion.
- Particular emphasis should be placed on the role of cognitive and metacognitive strategies in order to make any intervention effective.

It is considered necessary to teach effective learning and study strategies, through which students with learning disabilities will be substantially supported in order to minimize their weaknesses (Gakis et al., 2016). Especially, with regard to the problems faced by pupils with learning disabilities in the field of reading ability, the report of the National Reading Panel (2000) mentions as more effective methods of intervention: (a) the production of questions put by the pupils themselves in relation to the content of the text they read, and (b) the answer to questions put by the teacher subject to immediate feedback. Also, an important technique is: (a) the use of cognitive and semantic

organisers (e.g. diagrams), as well as (b) the graphical representation of the information makes it more understandable to the student.

In addition, another important technique is the production of summaries, through which the student is invited to identify the central idea of the text, to distinguish the basic information and to recast the text (Gakis et al., 2016). It is necessary to support pupils and intervention techniques to focus on (e-) teaching strategies for organising writing and enhancing post-cognitive skills, and it is a good thing not to overlook the importance of grammar, syntax, vocabulary and content (Graham & Harris, 2005). The way in which teachers instruct about the vocabulary and graphics should be clear, such as using precise language that concisely communicates the critical content (King-Sears, 2009).

Finally, the performance of pupils with learning difficulties and mathematics learning difficulties can be improved by clear systematic teaching, which provides guided and meaningful feedback training (Heward, 2011) and with increasing independence for the learner as understanding becomes more secure (Anghileri, 2006). In conclusion, we must not forget that educational planning takes into account the actions involved that are related to the educational material. Also, the student's learning specificities, as well as the psychological structure of his relationships with the family and wider social environment, are taken into account. On this basis, the teacher is invited to be a scientist, animator and educator, with initiatives and participation through decision-making in an ever-changing world in terms of conditions, knowledge and scientific approaches (Skoubourdi & Kalavasis, 2007).

#### 4. Conclusion

The literature shows the potential of subject-specific cases for enhancing mathematics teachers' pedagogical thinking and reasoning (Ball, 1988a, 1988b). Also, tools can effectively facilitate learning for most students by becoming powerful instructional tools in writing, reading comprehension and content-areas subjects across a large range of ages, grades and learning abilities (Ellis et al., 2005). It is important for teachers and e-tutors to understand that teaching pupils with learning disabilities is considered a rather demanding process, in which they are called upon to take into account not only the subject they will teach, but also the student's level of knowledge, the basic cognitive and emotional characteristics of these children, as well as to calculate their memory potential, the difficulties they face and in which areas, the ability to organise and manage the information taught, their view of their potential, their motivations and the social characteristics they bear (Botsas, 2008). Pedagogical skills in (e-)teaching are the challenge of the 21st century.

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