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## **Elementary Mathematics and Language Difficulties**

### **A Book for Teachers Therapists and Parents**

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#### **1. Purpose of the Book**

The book was written by an experienced teacher well acquainted with problems of teaching elementary arithmetic to children with language difficulties. Problems of learning the formal language of mathematics by children without any language difficulties have been well documented. Such problems are certainly encountered by children who experience difficulties with natural language. These children can be expected to have much more difficulties when confronted with the formal language of mathematics.

One of the major merits of this book is that the author has succeeded in adding an extensive theoretical background to its practical qualities. By taking this approach the author achieved two purposes:

- 1) Basing her practical knowledge on theoretical foundations and research findings,
- 2) Informing teachers of the well-established research in mathematics education that has been achieved in the last three decades.

While I have no way of knowing whether the author intended to make the second point, it is nonetheless, well achieved. Reporting on the research is in a language that can be read and understood both by parents and teachers.

#### **2. Structure and Scope of the Book**

The book is in two parts. Part One describes characteristics of children with language difficulties and the consequences of this when learning elementary mathematics. The characteristics dealt with are: weakness in symbolic understanding; weakness in organizational skills, and memory weakness. For each of these the author first clarifies how the above characteristic is related to mathematics – “What are the Problems?” and then, “How can we help?”

In presenting the problems the author demonstrates her profound understanding of the issues of elementary mathematics, and in giving advice, on how to help, she does not take the easy route, one that is traditionally taken for slow learners. She warns educators of this target population to beware of “false friends”, namely, she warns against relying on already acquired scattered knowledge of numbers that does not lead to comprehending the principles of the complete number system and might even distract rather than help.

For the first weakness (symbolic understanding) it all

seems quite straight forward. Needed at school is the understanding of the system of numbers as objects and their formal symbols. The author presents several representations for numeration – starting with tallies, Cuisenaire Rods, Slavonic abacus, via hieroglyphic symbols to including zero as placeholder.

It is the second weakness in organizational skills, that reveals the strength of this book. Organizational skills are needed widely and not just in mathematics. The author, however, has succeeded in stressing, where this will interfere specifically in learning of mathematics, and focused on the relevant aspects in mathematics, i.e. the decimal system, organizing quantities, word problems and spatial organization.

Part two of the book deals with practical work and consists of valuable practical suggestions for teachers who work with this type of population. Included are suggestions organized by mathematical themes, such as: non-count work, early number work, understanding sums and symbols, understanding the decimal system, etc.

#### **3. Theory-Based Practice**

As mentioned above, the first part of the book is organized around three major difficulties faced by children with language handicaps, namely, weakness in symbolic understanding, weakness in organizational skills, and memory weakness. Two other chapters in the first part deal with additional weaknesses such as understanding relative concepts, and auditory discrimination, while the last chapter is devoted to the social dimensions.

Part One includes many references to research findings. A valuable attempt is made to base the practical advice on theoretical grounds. From this standpoint, the various chapters are not equally weighted. First, the stronger parts. The author presents an approach to mathematics that is not usually found among practioners. Like mathematicians, she relates to numbers as objects and presents the triple additive relation among numbers, keeping in mind the connection between addition and subtraction. The traditional approach of presenting these themes to young children with difficulties was to connect numbers and operations to their daily experience. In daily experience numbers are used as quantifiers of other objects, such as: apples, pennies, children etc. The author rightly points to the significance of treating numbers as objects (mathematical objects), and she emphasizes the mathematical context of the mathematical operations. She presents addition and s subtraction, not as isolated operations representing ‘joining’ or ‘taking away’ but rather as constituents of a mathematical structure. Since part of the problems faced by her target population are lack of organizational skills, she values the structure of the number system and builds upon it. Her clear and careful analysis of the mathematical issues will assist teachers and therapists who are not well acquainted with such a mathematical point of view in helping children who experience the above-mentioned weaknesses.

Chapter 4 is not the natural continuation of Chapters 1-3. It does not address a special weakness of the target population but rather deals with a topic that is difficult for many children as well. Since this involves language

(relative concepts), it is, therefore, probably even harder for children with language handicaps.

Unlike the preceding chapters, Chapter 5, devoted to the Social Dimension, does not mention research findings as backgrounds for the practical advice. It deals with social interaction and adds a description of a lesson that exemplifies these aspects. As such, this chapter does not belong to Part One and is not treated in a sufficiently rich manner to justify its inclusion as a separate theme in this book.

#### 4. Practical Suggestions

The second part of the book consists of seven units, four of which are devoted to mathematical themes: non-count work; early number work; understanding sums and symbols; and understanding the decimal system. The other three units deal with money and time; improving spatial ability and miscellaneous exercises. The author takes each of these themes in turn and suggests how to teach it to children with language problems.

The author begins with non-count work. Here she makes the important distinction between count and non-count words, between defined and undefined articles and sheds light on adjectives, relations and quantifiers regularly used in language and which do not cause any problem for children without a language handicap. However this book is devoted to children with language problems and it is therefore important to stress these linguistic distinctions which might not be known to educators who work with this type of population.

Next the author moves on to early number work that starts with counters and their arrangements into groups. Here again the author tackles another weak point of the target population: the lack of organizational skills. In presenting elementary mathematics, there is always the risk of falling into the trap of too many procedures and algorithms, each relying on the preceding one. The author succeeded in reducing the number of topics to be dealt with and concentrated on the major themes that constitutes the core of early mathematics. Understanding sums and symbols; and, understanding decimal systems – are wisely selected and well presented themes. In each of the above the author presents the problem as well as the detailed activities that lead to the understanding of the concept. The attention to detail is really impressive, covering the conceptual development of each concept as well as the setting of the lesson and the methods to be applied. Though one can be concerned about dictated “lessons”, the abundance of means described in each lesson leaves the reader enough freedom to select whatever is appropriate.

At the end of this unit (Unit 3) the author goes into detail describing the Cuisenaire Rods, as she does later in Unit 4 concerning other materials such as the Slavonic abacus, or other templates. I found this to be too elementary and quite tedious. An appendix for concrete materials could serve this purpose just as well. The activities, on the other hand, comprise plenty of examples and activities that can enrich the repertoire of every teacher, and parent.

Unit 5 is devoted to money and time and justly a short unit, since there is nothing special in this chapter for the

target population and it is not as exhaustive as the other chapters in the book.

Unit 6 deals with improving spatial skills. As the author herself noted, nothing in the issue of spatial skills is directly relevant to children with a language handicap. However, she exemplifies how one can use spatial activities for improving language aspects. The verbalization by the children while working with spatial concrete materials can improve language skills, and she offers examples of such activities.

Unit 7: ‘Miscellaneous Exercises’ is in my view superfluous. Its contents could be better understood in other chapters within the relevant context. For example: ‘-ty’ versus ‘-teen’ is relevant when learning the number system and it thus does not deserve a special unit.

#### 5. Evaluation

In approaching a special population with some sort of handicap, educators expert in teaching such population often fall into the trap of making the subject matter (in this case mathematics) easier to teach. But what does “easier to teach” mean? Usually it means presenting mathematics in less abstract form, more similar to daily life. Following this line, they might end up with many isolated daily contexts and examples, while the mathematical content loses its structure, simplicity and beauty, and the students find it hard to comprehend. The author does not fall into this trap and I mainly appreciate her book for taking the other route. The simplicity implied by the author is based on presenting the clarity of mathematical structures with the aid of didactically structured materials. Reducing mathematics into a few well-organized themes, accentuates its simplicity. Consequently, it also becomes easier to learn. Its simplicity, however, does not lessen its richness in examples and didactical means.

As a researcher I found the first three chapters in which practice is related to research findings to be very good and interesting. The idea that a practitioner can synthesize research findings with such clarity and present these to other practitioners in a manner that will be understood as well as employed by them appealed to me and seems to be of major importance. The second part of the book in which the practical didactic suggestions were presented, appeared to me obviously detailed and not weighted at the same level. I could not always follow the rationale for the division into chapters and units but perhaps the opposite is true. Could be that practitioners, the expected readers of the book, those who must face the problems of language impaired children will have more appreciation for the second part that consists of an abundance of exercised and pedagogical means. Clearly, the author is an expert on teaching children with language handicaps; and that the book summarizes many years of successful experience with this population.

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