DIDACTICS OF TEACHING INSTRUMENTAL ENRICHMENT TO CHILDREN WITH SPECIAL NEEDS

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Introduction

One of the major advantages of the Instrumental Enrichment (IE) (Feuerstein et al, 1980) when compared to other cognitive education programs lies in its flexibility and the wide range of its application (see Kozulin 2000). One and the same set of IE booklets can be used for the cognitive enrichment of regular students and for the remedial teaching of severely learning-disabled children. Such a wide range of application becomes possible only because the IE material is flexible enough to accommodate different didactic approaches aimed at different target groups of students.

The issue of instructional approach becomes particularly important when the aim of IE intervention is to normalize the deficient cognitive functions in children with serious learning problems. In the present paper we focus on instructional methods aimed at the two major groups of children with special needs:

1) Children with impairment or underdevelopment of basic intellectual functions, and

2) Children with learning disabilities and educational deprivation.

The first group includes children whose manifest level of functioning reveals an underdevelopment of the most basic cognitive functions, thinking skills, and learning strategies. These children often receive an inadequate type or/and amount of mediated learning against the background of such etiological factors as genetic impairment (e.g. Down Syndrome) or neurological conditions (e.g. epilepsy). Often these children are labeled as mildly mentally retarded and are placed in a special education classroom. What is characteristic of these children is the weakness of their knowledge base and the underdevelopment of their conceptual apparatus. Compared to the learning disabled, the learning potential of these children is usually not high. This is the reason why the IE intervention for this group is aimed first of all at the development of the basic cognitive functions, strengthening of the knowledge base and the formation of elementary conceptual structures.

The group of “learning disabled” has much higher manifest level of functioning. These children often have a good intellectual level, but suffer from poor organization of learning activity, deficiency of certain cognitive functions and lack of operations essential for successful classroom work. The insufficient amount of mediated learning experience in these children is often associated with educational deprivation and/or an inappropriate type of instruction against the background of hyperactivity. Usually these children are labeled as "learning disabled" and receive a certain amount of special treatment in the context of regular schools. For this group the most characteristic deficiency is the lack of school-based skills, including planning and control of their own learning activity. For this reason, the focus of IE intervention for this group is on the development of planning, control and other metacognitive functions.

Instructional approaches described below were developed and tested in the framework of the afternoon IE intervention program offered at the ICELP. The pilot study group included twenty children with basic intellectual problems or learning disabilities who attended the program for two years. IE lessons were given either individually or in small groups.

1. Teaching IE to children with deficiencies of basic cognitive functions

1.1. *Intermediate Supports*

One of the serious problems experienced by these children is the difficulty solving problems that require a number of steps. If the problem requires a relatively large "quantum" of thinking energy the children lose track in the middle of the task and become confused. Although the difficulty of IE tasks increases gradually, sometimes this increment is still too large for the child. One possibility in making the IE material accessible to these children is to create intermediate supports and to break the task down into several sub-tasks. The same page of IE can be used several times, each time with a diminishing number of intermediate supports.

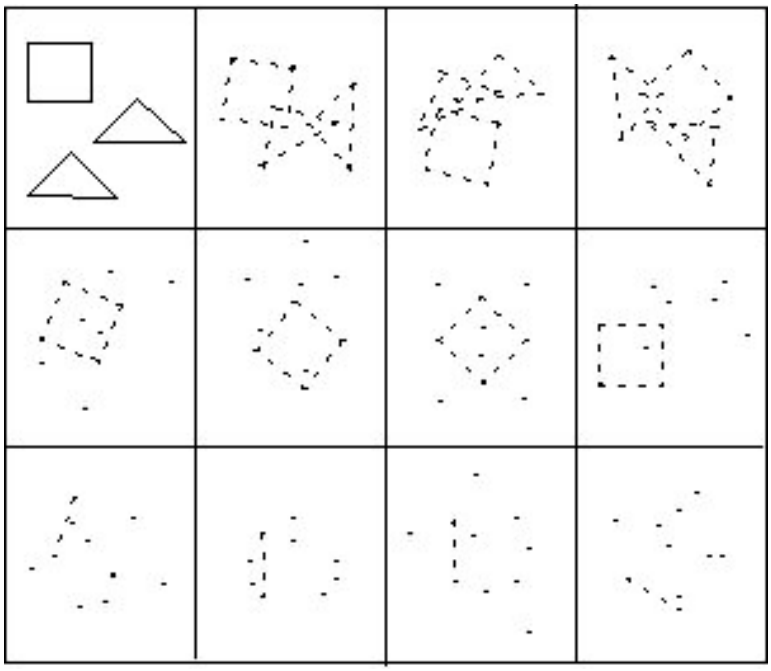


Figure 1

To illustrate the method of intermediate supports let us consider "Organization of Dots", page 2 tasks (Fig.1). First the children are offered a model page on which all figures are already drawn in different colors: the square in red, one triangle in blue, the other in black. The children's task is to copy the model page onto their own IE pages. This activity teaches them orientation within the space of the page, helps them to learn the sequence of operations and supports the acquisition of visual and motor images of the model forms. After the successful performance of this first task, the children receive the second model page with only squares drawn on it. The children can thus copy squares onto their pages, but must find and draw triangles independently. The third model page has only one side of the square pre-drawn. After finishing this third task, the child should be ready to work on the IE page without the model.

Another example illustrating the principle of intermediate support is the work on page 2 of "Orientation in Space I". For children with serious cognitive deficiencies even this concrete task poses serious problems. It is difficult for them to identify which side of the boy (front, back, left or right) is facing which one of the objects (house, tree, flowers, or bench). The intermediate supports take the form of marking the sides of the boy, e.g drawing a red badge on the boy's chest, blue on his back, a yellow band on his left arm and a green one on his right arm. In addition, all directions from the boy to different objects depicted on this page

are marked by colored arrows. Once the children master the task in this form, they receive a new model page in which the boy still has his sides marked, but the directions must be identified by the children themselves. During the third stage the children are given a standard page and asked to first mark the boy's sides by color badges and bands and after that identify directions. After this preliminary work the children should be able to solve page 2 problems without additional support.

1.2. *Creating prerequisites*

As mentioned above, the major problems for children with serious intellectual deficiencies are their insufficient knowledge base, poor conceptual structure and underdeveloped learning potential. These deficiencies require particular attention to one of the sub-goals of the IE program, namely providing concepts, verbal labels and operations missing in the child's cognitive repertoire. Even relatively simple IE instruments, such as "Organization of Dots", "Orientation in Space", and "Comparisons" presuppose some preliminary knowledge about such object parameters as shape, size, color, etc. At times, the children's lack of knowledge of these parameters becomes obvious from the very beginning of IE teaching, and at other times it reveals itself in the middle of the instrument when the child confronts new content or a new operation. In both cases it can be useful to add certain exercises thereby creating the necessary prerequisites for achieving progress in work with IE instruments. Below we will present two types of exercises: one based on the return to a particular page of the IE instrument already studied, and the other on the use of supplementary learning materials (cards with geometric forms).

Before starting work on "Comparisons" the teacher may wish to review with the students such notions as "parameter", "similar", "different", "shape", "color", "size", etc. This can be achieved by returning to the Error Page E-2 of "Organization of Dots" which should already be familiar to the children (See Fig.2). We suggest repeating this page while focusing the children's attention on the similarities and differences between different geometric figures. Following is a sample of teacher-child interaction:

Teacher: Look! (pointing to the rectangle). Why do you think this is a mistake?

Child: Because there's a square in the model and this is a rectangle.

T: That's right. This figure is a square - see its shape. (If necessary, the teacher may repeat the definition of the shape of the square). This is a rectangle. They are shaped differently.

Look here, what kind of a figure is this?

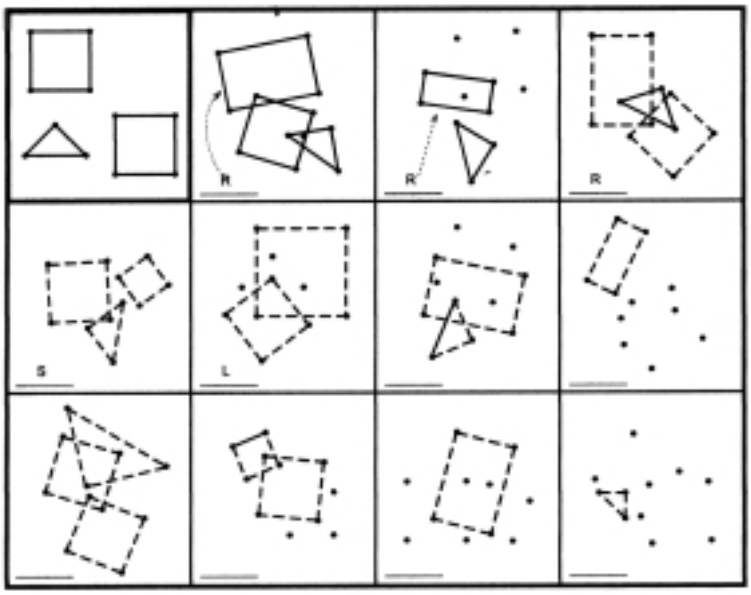


Figure 2

C: A triangle.

T: That's right. We call it a triangle because of its shape. Now, please show me the figures which are different from the triangle because of their shape.

(The child points to a square and a rectangle)

T: Very good. Now, show me figures with the same shape.

(Often the child only selects triangles of the same size as the model).

T: Good. Now look, what kind of figure is this? (pointing to a different sized triangle).

C: (Hesitating) A triangle.

T: Excellent. Does that mean that the first figure and this one are shaped similarly?

C: Yes.

T: Now, tell me how they are different? Look, do you think they are absolutely alike, or maybe there is still some difference?

C: This one is big.

T: You mean that this figure is bigger than the first one? You are right. Remember, we've already learnt that if one figure is bigger than the other one, we say that they have different size.

The next step in our didactic procedure is to add color to already reviewed parameters of shape and size. This can be done with the help of specially prepared cards depicting all 18 combinations of the following parameters: Shape: triangle, rectangle, square; Color: red, blue, green; Size: large, small.

The work with cards may include the following exercises:

- Sorting and re-sorting the cards (E.g. "Tell me how can we divide these cards? Is it possible to do this differently?)
- Finding a pair for the selected card matching color, then shape, then size.
- Naming one parameter which distinguished two selected cards.
- Selecting one parameter common to two cards.

- Comparing all parameters of two cards.
- Finding a pair for a specific card identical in color, but different in shape, and so on.

After this preliminary work that establishes the prerequisites of comparative behavior, the teacher may start mediating "Comparisons" instrument.

1.3. *Identification and transfer of the principle*.

Finding methods for the presentation of IE tasks to students with serious intellectual problems, is the necessary, but in no way sufficient condition of the IE intervention success. The pivotal element of IE teaching lies in the identification of the principle embodied in the IE task and its transfer to other objects and situations. Working with higher functioning children the teacher usually has little difficulties reinforcing just-identified principles with concrete examples from everyday life. For children with serious deficiencies it is precisely this moment of identification and reinforcement of the principle that poses the major problem. For this reason we would recommend the following sequence of instructional steps:

- Work with IE tasks
- Identification of the principle
- Discussing concrete examples
- Reiteration of the principle
- Return to the IE tasks.

Concrete examples should be selected from real life situations which are well-known and understood by the children. To illustrate this let us consider such a principle as a "point of view" embedded in the "Orientation in Space I" task in page 6. Working with this page the child should understand that each of the characters depicted can serve as a reference point. Each of them has his/her own point of view. The teacher's task is to make the notion of "point of view" generalizable and transferrable to different situations. This can be facilitated by using a supplementary picture of two people on the path that goes uphill (Fig.3) . One of the characters is about to walk uphill, while the other walks downhill. Following is a sample discussion of this picture:

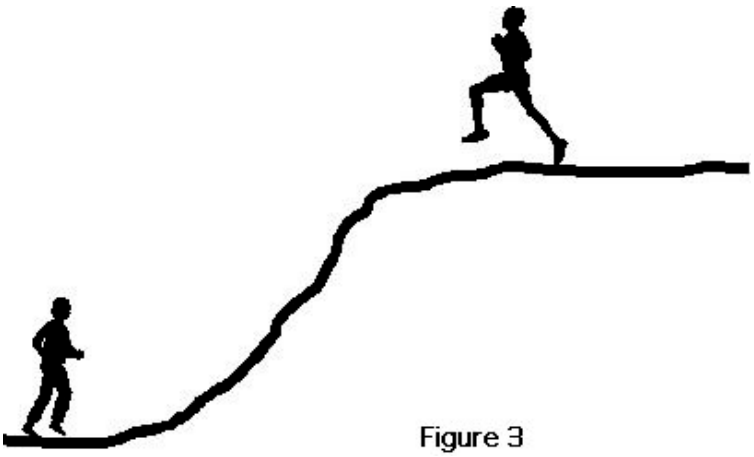


Figure 3

T: Do you think the first person is happy to have such a hill in front of him?

C: No. It's difficult to walk uphill.

T: Does he like this path? Is it easy or hard?

C: No, he doesn't like it. It's too hard.

T: Now look at the second person. He can simply run downhill. Do you think he will enjoy doing this?

C: Yes.

T: Does he like this path?

C: Yes.

T: Is this an easy path or a hard one?

(The child doesn't know what to say. The teacher should help him/her).

T: If the person is happy to run downhill then the path is...easy or hard?

C: (Surprised) Easy...

T: But when we talked about the first person we decided that the path was difficult, right?

(The child seems confused)

T: Don't be surprised, everything is O.K. For the first person the path is difficult. This is his point of view. For the second person the same path is easy. He has a different point of view. And for you, because you are going neither uphill nor downhill the path is neither hard not easy. This is yours, a third point of view. But the path remains the same. The same thing looks different if you take a different point of view. Look at our page (pointing to the IE page), it is the same thing here: The boy thinks that he is pointing right, and the woman thinks that she is pointing left, but they are pointing in the same direction. They simply have different points of view.

After such an intervention the principle of the point of view should be identified by the child in the appropriate IE tasks and other materials.

We have attempted to show that children with serious cognitive problems can benefit from IE intervention if an appropriate instructional approach is used. This approach include creating prerequisites for the work with IE pages, creating intermediate supports within the IE instruments, and providing intensive reinforcement for the process of identification of general principles.

2. **Teaching IE to children with deficient learning strategies**

These children who are usually labeled as "learning disabled" often have good intellectual abilities. Though some of them are backward in general and school based knowledge, their main problem is the lack of proper learning skills. They often do not know how to organize their problem-solving activity, they do not have a clear picture of the scope and limits of their knowledge, and they do not know how to request the necessary help from the teacher or a more competent peer. This means that even when mediation is offered to them they don't know how to receive it. Very often these students have particular problems with planning and evaluation of their own actions. That is why the focal point in helping these children is the development of their metacognitive functions and creating in them awareness of their own learning processes.

2.1. *Requests for help and selection of cues*.

One of the major goals for teaching IE to this population is to develop in them the ability to request relevant help and to identify useful cues within the learning material. Through the specially designed activities with IE pages and with the help of supplementary learning materials the students learn how to rely on their previously-acquired knowledge and skills, how to evaluate the problem-solving needs and how to work with supplementary means helpful in problem solving. At the core of this instructional approach lies the following

question addressed to the student: "What do you think can help you solve this problem? How could you make it easier for yourself?"

It is curious but also instructive that the child often has greater difficulty answering this question than solving the problem itself! That is why, making children aware of their own resources vis-a-vis the problem-solving situation is even more important than teaching them a specific problem-solving skill. Questioning about the desired help prompts the child to analyze the task, identify relevant previous knowledge and skills, remember cues which were useful in the past and pinpoint the major difficulty. To illustrate this process let us consider a student's work with a new type of task in "Analytic Perception", page 13 (Fig.4).

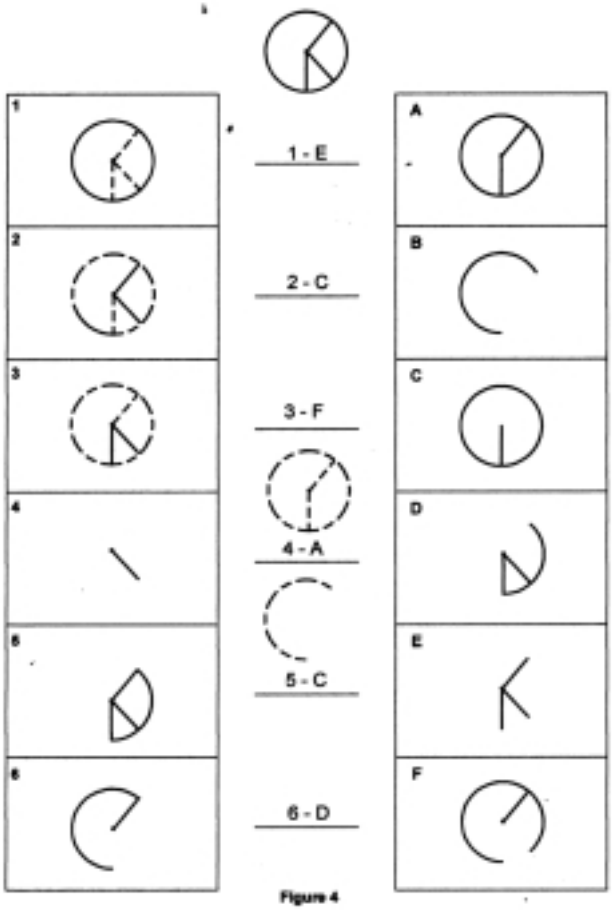


Figure 4

While the earlier "Analytic Perception" tasks required the student to complete a figure making it identical to the model, the Page 13 tasks are of a different nature. Students see a model figure and two columns containing parts that when joined together produce a model figure. Children often perceive this task as being very difficult and absolutely new, i.e. as having no connection to anything that they had done before. The instructional approach here is based on helping the students to establishing a connection between their previous experience with completion of figures, and the current task that requires mental representation of two complementary figures. The main idea is to show students how their already acquired knowledge and skills can work in the new context.

T: Do you think you can solve the problem now?

C: I don't know...It's too difficult...I don't know how to find the right picture.

T: What do you think can help you find this picture? What can we do to make the task easier?

C:I don’t know...If I could try all of them...But I don’t know how.

T: You don’t need to try all of them. Let me help you. Now I am covering the entire right column. Tell me, what is left?

C: Pictures...Pieces of the model.

T: How can we make the whole model out of these pieces? We’ve already done this before.

C: Yes, I know. I ought to draw what is missing.

T: O.K. I’ll give you this green pencil and you can draw what is missing in green. Start here. Tell me, which parts are you adding.

C: A circle...And a line inside.

T: What color is the part which has been missing?

C: Green.

T: Now look here. In this right column we have all the parts which were missing from the pictures on the left side. We’ll add a part from the right column to the part in the left column. I think you can find it now, because you’ve already drawn it and even explained how it looks.

C: Yes. Here it is, picture "C". It’s exactly like the green one.

T: Right. Do you understand how you can help yourself now?

C: Yes. I draw and look at the same one.

T: That’s right, draw, but only in the beginning. Later we’ll learn how to see the missing parts without drawing them.

Actual drawing of the missing parts should then be reduced gradually. We suggest the following steps to do this:

1. The child is asked to name the missing parts and draw them on a separate piece of paper.

2. The child is asked to name and draw the missing parts on a separate piece of paper, and then his/her drawings are taken away before he/she points to the missing part on p.13.

3. The child is asked to copy the task from the left column, then complete the figure after which the drawing is taken away and he/she is asked to give an answer.

4. Finally, the child is asked to draw the figure in his/her mind, name the missing parts, and then give an answer.

This sequence allows us to elevate the search for a cue to a higher cognitive level while keeping the students fully aware of its nature. The proper selection of a cue and the search for supplementary means of problem-solving requires the students to analyze their own thinking processes.

2.2. *Planning and control.*

The functions of planning and control occupy the central position in the IE teaching of children suffering from educational deprivation and the underdevelopment of learning skills. Using relatively simple IE tasks the teacher should be able to create in the child the ability to plan his or her own learning activity and to control it on a conscious level.

One should distinguish between two types of planning. "Routine" planning which is inseparable from the activity itself, is usually quite well developed in the children under discussion here. At the same time, advance planning that should be carried in a mental plane poses a very serious problem for these children. For them it is quite difficult to comprehend the thinking process as a chain of consecutive mental acts. Often hyperactive, these children

“first do and then plan”. They should be taught the habit of orderly mental planning as well as a hierarchy of cognitive tasks including both elementary steps and a major goal to be achieved by moving from one elementary step to another. Unlike the first group of children who find it very difficult to bear in mind more than one step at a time, the children in the second group are quite capable of quickly learning to see the major problem and secondary problems simultaneously.

One set of activities which is particularly important for this type of children is the development of alternative plans for solving complex problems. We will illustrate these activities with the help of the tasks from "Analytic Perception", Pages 6 and 7 (see Fig. 5). First, the child learns the following approach to problem-solving:

1. Each part of the model should be marked with a letter (e.g. A-E).

2. Each box should be checked one after the other. First try to find all parts (A-E) in the first box, then in the second, and so on.

3. The correct box should be selected.

4. The number of the correct box should be written in the circle.

This plan should be developed initially using the concrete material of each task and than formulated in the abstract form presented above. One may call this approach "sub-task oriented", because the child moves from one sub-task to another thus finding the correct answer. An alternative approach to the same problem can be called "element-oriented". The plan corresponding to this approach is as follows:

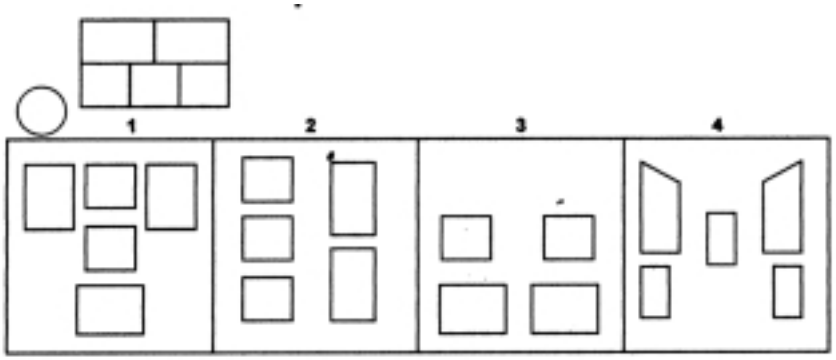


Figure 5

1. Each part of the model should be marked with a letter (e.g. A-E)

2. Every part should be checked one after the other. First look for part A in all boxes, one after the other, then look for part B in all the boxes and so on.

3. The correct box that contains all parts A-E should be selected.

4. The number of the correct box should be written in the circle.

It is extremely important to teach these children the concept of alternative planning . They should understand that the plan is not "latent" in the problem but should be developed, chosen and implemented by the child him/herself. In the above example the idea that a common problem solving goal that can be reached by a different route should be emphasized and conveyed to the child.

Exercises aimed at the deeper comprehension of the principle of alternative planning can be offered using "Orientation in Space I", page 10. The child who is already familiar with the material should be asked to classify all the tasks using an “element-oriented" approach. At the

basis of this classification lies the distinction between those elements (arrow, dot, direction) that are present and those that are absent and should be added. The resultant plan for problem-solving activity should be as follows:

1. Problems with arrow and dot present, and direction missing are selected.
2. Problems with arrow and direction present, and dot missing are selected.
3. Problems with dot and direction, and arrow missing are selected.
4. Problems with only arrow present are selected.
5. Problems with only dot present are selected.
6. Problems with only direction present are selected.
7. Problems without any information are selected.

Alternative planning will use a number of units of information as a basis, irrespective of specific elements. The resultant plan will be as follows:

A. All problems where 2 units of information are present.

B. All problems where 1 unit of information is present.

C. All problems where no information is given.

Bridging the principle of alternative planning to everyday and school-based problem solving can easily be achieved using the following examples.

Everyday activity. The child is sent to the supermarket with the following shopping list: sour-cream, tomatoes, sausages, cucumbers, cheese, coca-cola, chicken, scallions.

Entering the supermarket the child should develop a certain plan of shopping activity because it makes no sense to run back and forth from one department to another by simply following the sequence in the shopping list. The first alternative is to check all the shelves. Moving from one shelf to another the child checks which items on the shelf coincide with those on his/her list. If at the end one of the items is still missing the child has to repeat the whole procedure. An alternative approach to planning is to identify a group of items from the shopping list according to their nature, i.e. "dairy products", "vegetables", etc. After that the child heads to the first of the appropriate departments, i.e. "dairy products" picks up all items from the "dairy" group. Then the child moves to the next department, e.g. "vegetables" and so on. If at the end one of the items is still missing the child checks which group it belongs to and returns to the appropriate department.

School-problem solving. The child is given a list with the following mathematical problems:

a) 15 - =9	b) - 7 = 8	c) 16 - 9 =
d) 12 - 3 =	e) - 10 = 8	f) 19 - = 5
g) 15 - 12 =	h) 13 - 8 =	i) 14 - = 1
j) 11 - = 8	k) - 5 = 11	l) - 1 = 6

The child may move from problem to problem ("a" through "l") and in each case decide which element is missing and how to find it. An alternative approach is to select a certain group of problems depending on what is missing (minuend, subtrahend, difference). Thus

problems b,e,k,l will form one group, problems a,f,i,j the second group, and d,c,g,h the third group. The child solves all problems of one of the groups, and then turns to the next group, and so on.

Above we presented only a sample of everyday and school-based problems which can be used to foster the function of alternative planning. Each teacher should be able to develop his/her own collection of exercises based on material relevant to the child's home and school environment.

2.3. *Generalization of the principle and transcendence*.

Identification of the principles embedded in the IE materials, generalization of the identified principles and their transfer to a new material should take into account both the strong and the weak aspects of the children's cognition. The strong side of "learning disabled" children is their ability to comprehend a number of concepts that have a different degree of complexity. The weak side of these children is their lack of metacognitive skills aimed at comprehension, planning and control of their own cognitive processes. For this reason the identification and transcendence of the principles should be done not only in the plane of everyday and school-based activity, but first of all in the plane of the child's own reasoning. The child should be taught to apply the principles derived from the IE material to his/her own thinking and problem solving processes.

2.3.1. **Complex whole and its parts**. As an illustration let us consider "Analytic Perception" , page 13 which we have already used in our discussion of the selection of cues and requests for teacher's help (see Fig.4). One of the principles which can be derived from these tasks can be formulated in the following way: "One and the same complex whole can be assembled by joining together different parts if the combinations of these parts contain all the elements of the whole".This principle can be easily "bridged" to an everyday life situation. For example, a child is asked to dust a home bookcase which has four shelves and three sections containing the child's books, the parents' books, and the professional books. The child should come up with the plan as to how to dust the bookcase. If the child suggests dusting the books by sections this presents an opportunity of discussing the division of the shelf into different content sections. After that the child is asked to suggest an alternative plan. The child will probably have the idea of dusting

one shelf after another across the sections. This presents an opportunity of pointing out that one and the same complex whole (the bookcase) can be divided into different elements (sections and shelves).

The next step is to "bridge" this principle to a simple mathematical problem:

"Alex and Bob had several candies. They divided them evenly: Alex received 3 and Bob - 3. But at this moment they were joined by Alice. The children put all the candies back together and divided them again. Alex got 2, and Bob got 2. How many candies were left for Alice?"

After the child has solved the problem he/she can be asked to apply the above principle of the "whole and parts" to this problem. First of all the child should figure out how many candies there were altogether, i.e. how many elements constitute a complex whole. Then he/she can describe the combinations of different parts (candies received by different children) which together constitute this whole. At this moment the teacher may wish to draw the child's attention to the fact that the process of problem-solving itself has been divided into a number of tasks or parts:

1. Learning how many candies there were altogether.
2. Calculating how many candies Alex and Bob received during the second division.
3. Finding out how many candies were left for Alice.

The next stage is to "bridge" the above principle to the child's own work with the IE materials. The teacher may say:

"You know, we already saw a number of problems in IE which can be divided into different parts, and thus can be solved in more than one way".

At this moment the teacher asks the child to return to "Analytic Perception" , page 6 (Fig.5) which was used for teaching alternative planning. Together with the teacher the child promptly develops two alternative plans for solving the tasks. These two problem solving plans correspond to what we earlier identified as "element-oriented" and "sub-task oriented" approaches. The child usually easily identifies the constituent parts of each plan and differences between the plans. The teacher's goal here is to focus the child's attention on the "whole" which is a correct solution of the problem and its "constituent parts" which are different stages of problem solving reflected in alternative plans.

In order to firmly establish the principle of the formation of the whole from the different parts as applied to the problem solving activity, the following concrete task can be given to the child: Driving from New York City to Boston. A simple scheme is provided:

Hartford Worcester

New York City Boston

Providence

The child should be able to identify the alternatives: New York City -- Providence -- Boston and New York City -- Hartford -- Worcester -- Boston. What is important is that the "whole" i.e. the solution of the problem of reaching Boston from New York City remains the same, but its constituent parts can be different.

2.3.2. **Basis for comparison**. Another example of the principle which can be identified and then applied to the child's own learning activity is based on the work with "Comparisons" , pages 1-6. The tasks presented on these pages require the child to define the differences between objects either in two words, e.g. "circle vs. square", or as one super-ordinate concept, e.g. "form". After the child has finished working with the first six pages, the teacher asks him/her to compare tasks on pp.1-2 to the tasks on pp. 5-6. While comparing these tasks the child can use different methods of comparison. For example, the similarity between objects can be denoted in one word designating objects ("apples") and the difference in two words designating attributes ("big" vs. "small"). Now the child should use the same method for comparing tasks, rather than objects. Thus the comparison of tasks on p.1 and p.5 should appear in the following form:

Similarity: Comparison task.

Difference: To denote difference using one word vs. to denote difference using two notions.

An alternative and a more sophisticated way is to express both the similarity and the difference through super-ordinate notions (e.g. similarity - "apples", difference - "size"). Thus if the child applies this method to the comparison of tasks on p.1 and p. 5 he/she should arrive at the following result:

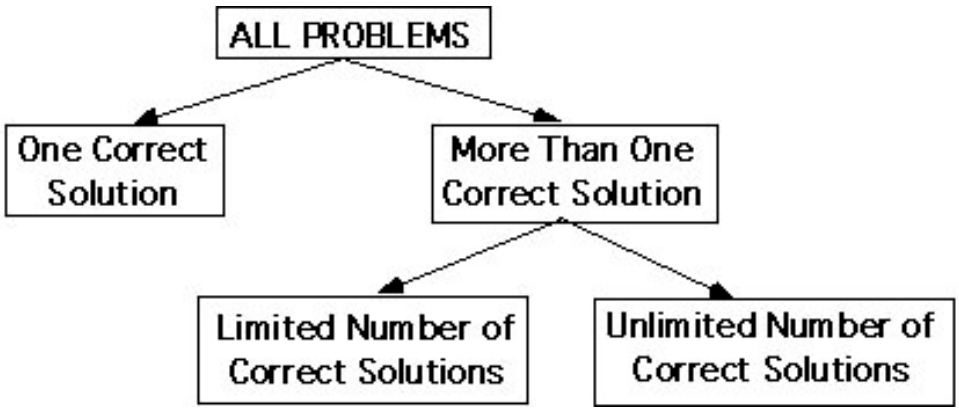
Similarity: Comparison task.

Difference: Ways of designating difference.

By going through this type of exercise the students start realizing that the principles they discovered by working with objects and situations "inside" the IE material can also be applied to the instrument itself and thus to any learning process.

2.3.3. **Comprehension of the task: Problems as special objects.** For educationally-deprived children understanding the very notion of "learning problem" often poses a serious difficulty. Because of their poor educational history these children have a very imprecise idea of different types of problems, their necessary and sufficient elements, the existence of problems with more than one correct solution, etc. Some of these children perceive any task as a riddle whose solution depends completely on what the teacher decides to be the right answer. The objective properties of the problem often remain obscure for these students. For this reason the development of the child's metacognitive functions should include not only planning, control, and generalization but also comprehension of the task.

In the following we will focus on one dimension in the comprehension of the task, namely on the differentiation of the tasks into those which have only one vs. numerous correct solutions. Without the mastery of such differentiation it would be very difficult for the child to make the transition to such higher order IE instruments as "Family relations", "Temporal relations" and "Syllogisms". The typology of problems represented in the earlier IE instruments is, roughly, the following:



The tasks of "Organization of Dots" provide a good example of "one correct solution" problems. The teacher may wish to use this instrument to review the child's understanding of this type of problems. The first tasks of "Orientation in Space I" are also "one solution", but p.5 has some "multiple solutions" tasks with a limited number of correct solutions, all of them using the "closed" system of 12 mutually-dependent parameters. Pages 8 and 9 of the same instrument offer tasks which have an unlimited number of correct answers. In addition we recommend using pp.12-13, and 9 & 11 of "Comparisons" for teaching children how to analyze tasks which look similar but have a different number of possible correct solutions. The tasks of "Comparisons", pp.12-13 have an unlimited number of correct solutions, while the "similar" tasks of pp.9 & 11 have only one correct solution. The difference stems from the fact that students have to respond to the tasks on pp.12-13 by drawing their own figures which can be different, while the response on pp. 9 and 11 is in the form of selecting a proper combination from already given answers.

After the principle of "one correct vs. multiple correct solutions" has been identified and formulated the teacher may start "bridging" it into school material.

Mathematics. When confronted with a problem: "Name a number greater than 3,409", the student should understand that the number of correct answers to this question is unlimited. At the same time, the question: "Name the whole number which is greater than 2,089 but smaller than 2,394" has a large, but limited number of correct answers. The question “How many whole numbers are between 2,325 and 2,334”, has only one correct answer.

Geography. It is important to draw the students’ attention to the fact that the formulation of the task has a major importance for the determination of the "field" of possible answers. Sometimes, even a slight change in the formulation, alters the problem. For example, the question: "Which countries have borders with France?" has more than one correct answer. At the same time, the task: "Name all the countries that have borders with France" has only one correct answer because all countries (i.e. Belgium, Luxembourg, Germany, Switzerland, Italy, Spain) should be named.

We recommend that in all those IE tasks where there is more than one correct solution, the process of task analysis should include the procedure of identifying the "field" of possible solutions.

Conclusion

What has been described above is just a general framework for using IE with special needs children supported by selected illustrative examples. Our goal was to identify certain focal points at which the chosen didactic means can attune the IE program to special needs of children with various cognitive and learning deficiencies. Practitioners using IE are certainly welcome to amend and expand our catalogue of didactic approaches. One may wish, for example, to add special didactics for the enrichment of conceptual reasoning in children with deficient basic cognitive functions. Additional approaches can certainly be developed for to facilitate the acquisition of various metacognitive skills by children with deficient learning strategies. As to "bridging" we believe that each teacher should have his/her own collection of "bridging" exercises. These exercises should reflect both the socio-cultural context of the child’s upbringing and the requirements of the given educational system. In any case, the IE program is not a fixed sequence of notes, but rather a "jazz melody" which each IE teacher uses to "play" his/her own educational improvisation for the child’s benefit.

References

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[a] For an earlier version of this paper (in Hebrew) see: Lurie, L. (1999). Didactic methods of teaching IE to special needs students. In D.Tzuriel, Ed., Mediated Learning Experience: Theory, Application, and Research. Kiriat Bialik: Ah Publishers.

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