

Chapter 9.

Formation of Higher Mental Functions in Children with Special Educational Needs via Social Interaction

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Abstract: Due to a large-scale process of reforming the system of education, which necessarily embraces the issue of educational inclusion, there is a pressing need for developing children with special educational needs (SEN) in the learning situation with normally developing children (ND). The experiment, based on L.S. Vygotsky's ideas about the importance of social interactions in the process of development and the idea about the joint-distributed form of activity as the genetically original form of learning children, demonstrates, that including children with SEN and ND children into joint learning activity is a necessary condition for the development of their higher mental functions (HMFs), as well as a necessary condition for organizing inclusive education.

The chapter presents the results of an experiment on developing HMFs in children with SEN and ND children on the example of solving problems on understanding multiplicative relationships.

Key Words: higher mental functions, joint-distributed activity, inclusive education, special educational needs.

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INTRODUCTION

Education of children with special educational needs (SEN) is a challenge both to the educational practice and to scientific research. In L.S. Vygotsky's cultural-historical scientific school this issue is framed and addressed in the context of changing the child's abilities and

capacities to join a social situation and participate in various interrelations that emerge with age-mates and adults.

L.S. Vygotsky argued that neither the teacher, nor the child deal with a “physical defect” directly [Vygotsky, 1983^a, p. 52]. The issue has to be regarded more broadly as a matter of social consequences that are triggered by the “defect”, that is – as a matter of social deprivation and, therefore, of *under-development* of higher mental functions (HMF). In its turn, *under-development* of HMF aggravates the child’s social deprivation. L.S. Vygotsky regarded the issue of educating children with SEN, as well as normally developing children, first of all as a social challenge. His idea that the process of development is due to the social environment finds its fullest expression in the general genetic law of development of HMF, where he claims that social interactions between the child and surrounding people underlie the inner structures of psyche. L.S. Vygotsky argued: “Every function in the child’s cultural development appears on the stage twice, that is, on two planes – first, on the social plane, and then – on the psychological plane; first, among people as an inter-psychological category, and then – within the child as an intra-psychological category”¹ [Vygotsky, 1983^b, p.145].

Developing the key principles of cultural-historical psychology, A.R. Luria followed L.S. Vygotsky in arguing that the child “from the very beginning of their life establishes necessary relations with other people, learns the objectively existing language system and assimilates with its help the experience of other generations. All this is the determining factor in the child’s further mental development, a determining condition for the formation of those higher mental functions that distinguish the human from animals”² [Luria, 1962, p. 30]. Studying the specificities of the development of HMF, A.R. Luria managed to unify into a comprehensive system the knowledge about the biological fabric of the brain, its physiological functioning and the psychological concept, explaining the process of its development. Analyzing A.R. Luria's approach to studying

¹ Translated by authors.

² Translated by authors.

speech, Oliver Sacks emphasizes that “the development of language ... was never seen by him as an anatomic development of “language areas” in the brain, but as resulting from the interaction of mother and child, from the negotiation of meanings between mother and child, mode of interaction or “betweenness”, and *this* as a prerequisite for, and needing to be structuralized in, the developing neuro linguistic systems of the brain” [Sacks, 2015, p. 32]. B.D. Perry, building on research, demonstrates, that the earlier the process of the child’s normal social functioning is restored, the more likely positive dynamics in their development is to be expected [Perry, 2002, p. 92-94]. He argues, that social deprivation has a particularly negative influence on brain development in early childhood (2-4 years), resulting in physiological under-development, and leading to disruptions in such mental functions as speech, attention, self-control etc.

Thus, the above-mentioned premises imply that specially organized social interactions between child and adult represent an important factor that contributes to the child’s overcoming any social and educational difficulties. Therefore, by including the child into joint activity we create conditions for eliminating “the main cause of the under-development of HMF”, and by developing HMF via social interactions we give the child a chance to overcome social deprivation. This allows us to address educational inclusion as an issue of social interactions of children with SEN and normally developing children (ND), as the emerging interactions and interrelations trigger changes in the social situation of development, boosting the development of higher mental functions.

Following L.S. Vygotsky and A.R. Luria, we hypothesized, that development of higher mental functions in children with SEN is possible in a situation of specially organized interactions with age-mates and adults, where particular processes are launched, determining emergence and development of the so-called child-adult “communities”³. Primarily, these processes include

³ In Cultural-Historical Theory and Activity Approach by L.S. Vygotsky, A.R. Luria and A.N. Leontiev a special notion is used - “obstchnost”, which designates a particular kind of socio-emotional unity of the participants of the social situation. The closest equivalent of this concept in English is “community”, that we will use in this chapter.

communication and mutual understanding, which to a large extent influence joint problem solving and, eventually, the development of a child's thinking.

This standpoint is confirmed by experimental data. According to F. Erdogan, cooperative learning, supported by reflective thinking activities such as writing, journal writing, reflective dialogue and thinking aloud, contributes to the development of critical thinking skills. Erdogan illustrates this in her research on learning, where students were given the possibility to discuss with their group members and evaluate their own activities with the “Group discussion strategy”, which transforms reflective activity into a social activity. Erdogan found out, that students, who analyzed peers’ activities, thoughts, interactions and gave feedback to each other, developed critical perspectives during the study. Thus, Erdogan argues that the very process of the analysis of children's interactions with each other paves the way for the development of thinking [Erdogan, 2019, p. 101].

N. Gagne and S. Parks, who studied interaction and mutual support in the process of joint problem-solving [Gagne & Parks, 2013, p. 205-207], argue, that the success in collaborating may be due, at least in part, to the type of the problem, given to the child. In this study, students were given tasks designed to foster positive interdependence and individual accountability (e.g. crossword jigsaw task, where the clues were distributed amongst the team members). Thus, the tasks themselves acted as a scaffold to facilitate interaction.

Following L.S. Vygotsky's ideas about the interrelation of development and means of learning, J.K. Hall, who investigated the development of language skills in the process of second language acquisition depending on students' participation in different classroom interactional practices, argues that: “what students take away from their classrooms in terms of target language knowledge and skills, is intimately tied to the kinds of interactional practices that teachers create in their talk with students” and that “teaching practices are simultaneously prerequisite and product, the tools and the results of language learning” [Hall, 2010, p. 12]. Therefore, “the question about how language is acquired and represented in the mind of an

individual learner can only be answered by looking first not at WHAT is being talked about in the classroom interaction, but at HOW the talk is being accomplished in the interactional practices used to teach” [Hall, 2010, p. 12].

E.F. Fitch and K.M. Hulgin conducted research on the process of teaching children to read in inclusive classes in a situation of joint work via dialogic learning. They managed to show that, in the process of dialogue and in the course of emerging communication, children exchange standpoints and positions concerning the learning task, they discuss, explain and convince each other, they also evaluate each other. Thus, they develop an understanding of each other's positions – that is, mutual understanding, which, according to E.F. Fitch and K.M. Hulgin, leads to the construction of a “shared meaning”. They argue that, apart from developing reading skills as the result of learning, the participants of the specially organized joint activity also developed cooperation skills, which resulted in the development of their thinking abilities. Referring to L.S. Vygotsky, the authors argue that children acquired (interiorized) the means of thinking [Fitch & Hulgin, 2013, p. 12].

As V.V. Rubtsov's research demonstrated in an example of joint problem-solving by children of 7-12 years (i.e., tasks on including sub-classes into a class by J. Piaget), there was a profound internal connection between the ways children interaction (i.e., means of cooperation) and the level of development of the operational structures of the child's thinking (J. Piaget's concept). Particularly, V.V. Rubtsov found out that a correct understanding by children of the content of multiplicative relations, which corresponds to a high-level of development of operational structures, develops in a situation, where exchange of actions takes place, when the very means of interaction between participants and the ways how it can lead them to the right solution, becomes the subject of their analysis. As it was demonstrated in the research, the processes of communication and mutual understanding had a strong impact on the efficiency of exchanges in joint action. According to V.V. Rubtsov, this influence revealed itself in the fact that participants perceived the subjective content of the problem (multiplication of attributes) as an

indicator of the possible means of interaction, answering the terms of the problem (the relation of attributes as a “sign of action”). This initiated the participants' new attempts to find a solution and new tests in organizing efficient interactions [Rubtsov, 1994, p. 35-47].

AIM OF RESEARCH AND METHODS.

Our research was aimed at revealing and experimentally investigating the processes that influenced inclusion of children with SEN into joint problem-solving. We particularly focused on the processes of communication and mutual understanding and tried to demonstrate how, in the course of these processes, new ways of interaction appear in the emerging child-adult “communities”, which mediates the development of speech, attention, memory and thinking.

In this research, the Method of the “Scale” was used, which was elaborated by V.V. Rubtsov and L. Martin, for studying the impact of social interactions on the efficiency of solving a set of tasks on balancing the moments of force [Rubtsov, 1994, pp. 93-106]. In contrast with the earlier research, we applied this method with the aim of revealing and experimentally investigating the processes that contribute to children's inclusion into joint problem-solving and their extending the boundaries of communication and interaction with each other and with the adult. In this method a special installation was used, a “Scale” [Martine, 1983, p. 76-78]. This “Scale” was a metal circle fastened at the center on a tripod (the center of the circle is also the center of the equilibrium). Along the diameter of the circle, an indicator line was drawn with divisions equidistant from each other. The experimenter placed on this indicator line weights (magnets) equal in weight. The participants could change the number of magnets as well as the distance to the center of the indicator line. Children were sequentially offered 12 tasks on balancing the “Scale” (fig. 1). For solving the task, children had to jointly figure out the equilibrium of the moments of force in relation to the center of gravity. Observing the interaction of children in the process of problem-solving made it possible to investigate the emerging communication and mutual understanding, and to evaluate how these processes influence the development of speech, thinking and attention.

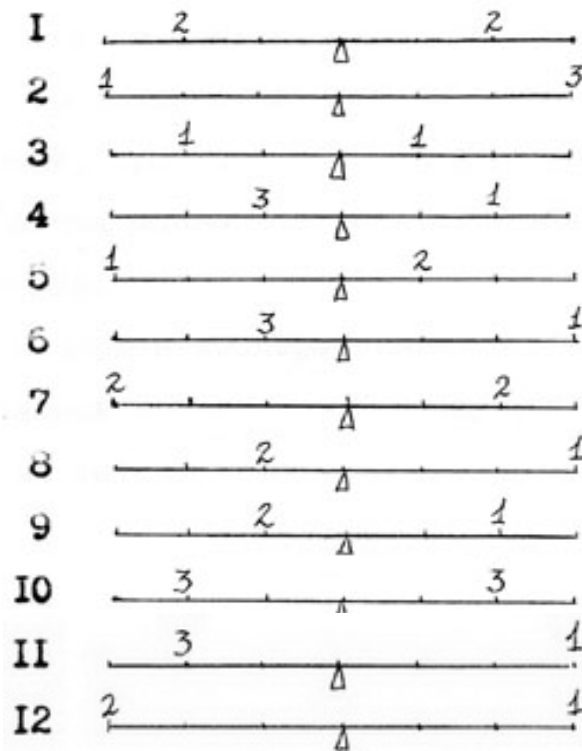


Figure 1. Examples of experimental tasks (the numbers on the picture indicate the number of weights, and the markings on the line indicator represent the distance from the weights to the center of gravity).

The experiment was conducted in two phases. In the first phase (individual series), each participant had to answer the question, whether the “Scale” would be in equilibrium with a given distribution of weights. The weights were placed by the experimenter and the children did not replace or remove them. Depending on the orientation of children on the interrelation of factors, important for balancing the “Scale” (weight and distance to the center of gravity), the differences in children's understanding the rules of the balance of the moments of force were identified and the level of the development of each child's thinking abilities was indicated. In the second phase (cooperative series) children jointly solved the tasks on balancing the moments of force, which allowed us to study the peculiarities of children's interactions with age-mates and adults, as well as to analyze the processes, that reflected the characteristic features of the emerging “community” and, eventually, influenced the development of HMF.

Participants of the study were 8 primary school children, ages between 7 and 9, attending a public school in Moscow (Russia). Among the participants there were ND children and children with SEN:

1. Misha, age 8.1 – first year primary school student with delayed psychological development. Had problems with contacting age-mates and adults (teachers), emotionally stunted, very passive at lessons. Did not contact his group-mates.
2. Nikita, age 9.3 – first year primary school student with cerebral palsy. Easily contacted age-mates and adults, shy, rarely initiated dialogue. Only active at lessons when directly addressed by the teacher.
3. Lena, age 9.11. – third-year primary school student with hearing impairment. Easily contacted age-mates and adults, open, communicative. Active at lessons.
4. Grisha, age 8, 10 – second-year primary school student with severe speech deficiencies. Selective in contacting age-mates, emotionally stunted, conflicted. Had difficulty in contacting adults. Passive at lessons, completed the tasks with difficulty.
5. Masha, age 8.2 – first year primary school student, ND. Easily contacted age-mates and adults, communicative and open. Active at lessons.
6. Oleg, age 8.8 – first year primary school student, ND. Easily contacted age-mates and adults, communicative and open. Active at lessons.
7. Samirghon, age 9.7 – third year primary school student, ND. Easily contacted age-mates and adults, communicative and open. Active at lessons.
8. Arina, age 9.3 – second year primary school student, ND. Easily contacted age-mates and adults, communicative and open. Active at lessons.

Based on the results of the first phase of research (individual series), we identified 4 types of orientation⁴:

⁴ Types of orientation, identified in the first phase of experiment, correspond to the types, described in the works by V.V. Rubtsov and L.M. Martin [Martin, 1983; Rubtsov, 1994].

Type 1 – Children with this type of orientation took into consideration exclusively the factor of weight while solving the task. This type of orientation was demonstrated e.g. by Nikita. He gave the following arguments: “It's heavier on the right, because there's a small weight here, and a big one here” (Task 1), “The Scale will be in equilibrium because there is one weight on each side” (Task 5).

Type 2 – Children with this type of orientation took into consideration mostly the weight of magnets, however they correctly grasped the factor of distance while solving the tasks on equal weights. This type of orientation was demonstrated e.g. by Masha, Samirghon and Oleg, who gave the following arguments: Masha: It's in equilibrium, because there's an equal number of magnets (task 1), “It's heavier on the side with two magnets, because there're more weights and they're heavier”, (Task 5), or “In equilibrium because these magnets (on the left) are closer to the edge” (Task 7); Samirghon - “In equilibrium, because they are identical” (Task 1), “It's heavier on the side with two magnets” (Task 5) or “In equilibrium because the weight is located at the edge of the indicator line (on the right), but these magnets weigh more (on the left)” (Task 7); Oleg - “In equilibrium because they weigh the same” (Task 1), “To the left. Because they're located near the edge, and there're two magnets here and two magnets there” (Task 7).

Type 3 – Children with this type of orientation took into consideration mostly the distance to the center of gravity. This type of orientation was demonstrated e.g. by Misha and Grisha, who gave the following arguments: Misha - “Towards side 1, because it's at the edge” (Task 1), “Towards side 1, because it's at the edge” (Task 6), Grisha - “To the left, because it's closer to the edge” (Task 3), “To the left, because it's closer to the edge, and these aren't” (Task 7).

Type 4 – Children with this type of orientation took into consideration both factors and correctly grasped the significance of each factor for getting the “Scale” in equilibrium. They correctly identified the connection between weight and distance; however, they failed to formulate this connection in a form of equality between the moments of force, which resulted in

mistakes. This type of orientation was demonstrated e.g. by Lena and Arina, who gave the following arguments: Lena “There are three magnets here and they’re closer, and there’s one magnet here and it’s farther” (Task 4), “To the side with two magnets, because there are two magnets and they’re closer, and here there's one magnet and it’s farther” (Task 5); Arina “In equilibrium, because three magnets are more, but they're on a small level, and here there are fewer magnets, but they're on a bigger level” (Task 4).

In the second phase (cooperative series), the group was divided into pairs, where participants demonstrated different types of orientation. While organizing the pairs, we assumed that, apart from an intellectual gap between children with SEN and ND, there is also a socially-personal gap between them, which is determined by their individual characteristics. This circumstance was particularly taken into account while organizing group work. There were four pairs who took part in the experiment:

- Misha (SEN, type 3) – Masha (ND, type 2)
- Nikita (SEN, type 1) – Oleg (ND, type2)
- Grisha (SEN, type 3) – Arina (ND, type 4)
- Elena (SEN, type 4) – Samirghon (ND, type 2)

Children were asked to bring the “Scale” to equilibrium, while working together, on the condition that the operations were distributed between the participants in such a way, that one of them could move the weights along the indicator line on their part of the installation, and the other one could increase or decrease the number of weights on their part of the installation exclusively on the indicator line, where the experimenter had placed them. These conditions allowed us to create situations where the problem could not be solved by one participant without the other.

After the cooperative series in the second phase of the experiment, the individual series was repeated, where children were once again given the tasks from the first phase. This allowed us to indicate changes that occurred (or did not occur) in the participants' understanding of the multiplicative relations. It also allowed us to link these changes with the processes of communication and mutual understanding, emerging in the situation of joint activity and interactions in the process of problem solving.

ANALYSIS OF THE RESULTS.

This study has shown that the interconnection between *communication, mutual understanding and means of interaction* may be perceived as an integral indicator of children's inclusion into the joint means of problem solving and, therefore, as a substantive feature of the emerging "communities", which determines the new framework of the possibilities of development of HMF in children. The analysis of the collected data allowed us to identify 4 types of "communities" ("obstchnost"). The main features of each type of "community", based on the results of the empirical data, are presented in table 1.

Table 1. Types of children's "communities", emerging in the situation of joint problem solving (on the example of solving a class of tasks on balancing the moments of force)

Type of "community" ("obstchnost") (means of interaction)	Processes of communication and mutual understanding, characterizing the joint search for a means of solving the problem
<u>1.Pre-cooperative:</u> There is no interaction between participants. Children are not involved in the joint search for a means of solving the problem.	Processes of communication and exchange of actions, aimed at the search for a means of solving the problem, do not emerge. There is no mutual understanding.

<p><u>2.Pseudo-cooperative:</u> Interaction between participants is substituted by actions of one of the participants. In some cases, the task is solved by one participant (individually).</p>	<p>Communication that emerges between participants does not affect the content of the task. There is no understanding of the possibilities of actions of the other participant and no exchange of actions, which determine the search for a joint means of solving the problem.</p>
<p><u>3.Cooperative (organizational):</u> The emerging joint action relies on the interaction of participants, based on simple cooperation of the operations performed. Children search for the solution of the problem relying on the possibilities of individual actions without analyzing the means of interaction itself. The problem is solved.</p>	<p>Mutual understanding of the possibilities of individual actions and exchange of actions are determined by the search for a joint means of solving the problem. Communication is not focused on the the search of a joint means of solving the problem. Participants are concentrated on solving the problem, rather than on figuring out, how to organize interaction in order to find the right solution.</p>
<p><u>4.Meta-cooperative (reflective-analytical):</u> The subject of the participants' analysis is the means of interaction itself, which makes it possible to transform the means and solve the problem. The problem is solved due to the inclusion of individual actions into the joint action and exchange of actions.</p>	<p>Communication is aimed at discussing the possibilities of including individual actions into the joint action. The search for the correct solution is transformed for the participants into the task of interaction and revealing a joint means of solution. Mutual understanding is mediated by the search for means of interaction. Organization of individual actions in joint action becomes the goal of interaction. The way is paved for new relationships, and, as a result, – for the emergence of a new social situation, determining new aims and goals.</p>

Let us focus on the **four types of “communities”**, in more detail.

1.Pre-cooperative type of “community” (“obstchnost”).

This type of “community” is characterized, primarily, by a lack of productive interactions between participants. The processes of communication and exchange of actions, aimed at the

search for a joint means of problem-solving, did not emerge between children. In a number of cases, “speech for oneself” emerged, which accompanied individual operations (e.g. “I made it heavier”, “And what if I take it away?”) and non-directed appeals to experimenter (e.g. “I know, I know how I can do it... like this”), identifying possible variants of the child's actions. The task to understand the partner's aims and possibilities did not acquire significance for these children. Understanding the rules of their own actions was the priority for these children. They did not get involved in the joint search for solving the problem and performed exclusively individual attempts to cope with the task.

Example 1. Misha and Masha (Misha was responsible for the weight, and Masha was responsible for the distance).

Task 1.

Masha: I can move (moves the magnets).

Misha (At the same time tries to move the magnet, but turns it the wrong end and the magnets repel). Oops. Wrong end. (turns the magnet and chooses the right side).

Masha: (observing Misha's actions and moving her magnets to the center of gravity).

E: You can only put the magnets on the indicated places on the indicator line.

Masha: (moves the magnet one marking on the line.)

Misha: (wants to remove one magnet).

E: Take your time. Misha put 3 magnets. Let's have a look how it works.

Misha: (pointing at the installation and laughing). Wrong. (Then removes one magnet and tries to put it the wrong end). And this is the wrong side. Flies away all the time (removes the magnet).

Apparently, the children did not grasp the content of the task, represented as an interrelation of factors. For them the task itself (to bring the “Scale” in equilibrium) and the impossibility of solving it became only an indicator of the limitations of their individual actions. The necessity to overcome the emerging limitations, preceded by the requirement of the adult, led the children to the need for communicating with each other, and, thus, to discussing and understanding the actions, envisaged for each of them.

2. *Pseudo-cooperative type of “community” (“obstchnost”),.*

The analysis revealed that communication that emerges in this type of “community” does not address the content of the task and does not contribute to the search of a joint means of solving the problem. Understanding of the aims and possibilities of the other participant also did not emerge, and, thus, there was a lack of mutual understanding. However, while understanding the limitations of their own (individual) actions, that were established by the experimenter via distribution, the participants empowered themselves to act “for the other”, performing the action instead the other participant (“for him”) without agreeing on that.

Example 2. Misha and Masha (the same participants)

Task 4.

Masha: There should be more here (**pointing** at Misha's magnets).

Misha: (Adds 1 magnet)

Masha: (Moves the magnets to line 3)

...

Misha: (Removes 1 magnet)

Masha: (Moves her magnets to line 1). We should put more there.

Misha: (Not reacting. Playing with magnets).

E.: Misha, this won't help you to tackle the task.

Misha: (Adds 1 magnet)

Masha: (Moves to line 2). One should be removed from here (**pointing** at Misha's magnets).

Misha: (Removes 1 magnet)

Masha's attempt to include her group-mate into joint work remain unsuccessful.

Example 3. Nikita And Oleg (Nikita is responsible for weight, and Oleg – for distance).

Task 3.

Nikita: (Moves his magnets closer to the edge of the "Scale")

Oleg: Stop, stop, Nikita, put them here (**pointing** at line 2. Then starts gradually removing his magnets from the installation). Wait, don't do anything now.

Nikita: (Stands up, though used to sit and observe. Oleg stands up all the time).

Oleg: O, it's in equilibrium!

E: Great! Is there any other means?

Nikita: (Moving the magnets to line 3).

Oleg: Stop! Like thiiiiiiis (adds one magnet)

Nikita: Just a bit... Like thiiiiis (prolongs the sounds, makes an intonation, puts the magnets between lines 2 and 3).

Oleg: No, a bit more. Put them here (**points** to line 2).

Cooperation between children in this situation was replaced by actions of one of the participants. At this point a distinctive "manipulation" of the actions of the other could be observed, as well as orientation exclusively on finding a concrete solution to the task. It is also important to highlight the emergence of the *pointing gesture*, which testifies that there was a change in how children address each other – appealing to the other became directed, and attracted the attention of the group-mate to the search for the means of solving the task. This fact is particularly meaningful for understanding the peculiarities of the indicated forms of "communities".

Vygotsky particularly emphasized the pointing gesture as "the basis for all higher forms of behaviour" [Vygotsky, 1983^b, p. 168], as a gesture, directed towards the other person and being a means of connecting with them. It is possible to assume that the emerging form of appealing, based on the pointing gesture, may be regarded as the first stage of the change of the means of interaction between participants and the development of the joint action per se, since in this case the means of interaction became the focus of the children's attention.

In this type of “community”, however, the emergence of the pointing gesture in one of the participants did not change the position of the other participant – only one participant took an active position and the task was solved only partly. That is why some of the participants could not overcome the given means of distribution of actions and make a step forward in the development of a joint means of problem-solving.

The analysis of the results of joint work of Nikita and Oleg showed that this kind of “community” may not be considered fully efficient, since a positive effect on development could only be noticed in one of the participants. In the second individual series Nikita did not indicate the interrelation between the factors of weight and distance and was consistently oriented on the weight of the magnets. He also made typical mistakes in the interpretation of this factor (“Will go to the side of magnet 1, because 3 are more, because 3 are heavier”, “Will go to the side with 2 magnets, because it is lighter, than 1 magnet”). In Oleg’s case a different picture could be observed. In the first phase, while taking into account both factors, he still did not understand the interrelation between them and, thus, made mistakes. However, in the next phase the child started to interrelate the two factors and solved the majority of the tasks (“It’s in equilibrium, because here it’s heavy, but they’re placed far, and here there’s one, but it’s close, very close”, “To the side 3. Because they used to be here, and now they’re closer here”). This testified that the child developed an understanding of the rule of balance and, therefore, indicated a step in the development of his thinking.

3. Cooperative type of “community” (“obstchnost”).

Children, who built this type of “community”, engaged in an interaction, based on the cooperation of the actions that they performed. They searched for the solution, considering the possibilities of individual actions, however they did not analyze the means of interaction per se. The constructed joint action remained unstable, emerging in the situation of the distribution of actions and their exchange; it was often again replaced by the participants' individual activity.

Example 4. Misha and Masha -
Task 8.

Misha: (removing 1 magnet)

Mahsa: (simultaneously with Misha's action) 1 should be removed (**pointing** at Misha's magnets with her finger)

Misha: (moving his magnet to line 1)

(The task is solved by establishing a simple identity)

E: Is there any other solution?

Misha: (adds 1 magnet)

Masha: (moves her magnet to line 2)

(The task is solved by applying the rule on balancing the moments of force)

Masha: (leans to reach for her magnet, but does not take it first, looking at Misha).

Misha: (adds 1 magnet. Observes what Masha is doing).

Masha: (only after Misha's actions starts moving her magnet to line 3).

(The task is solved by applying the rule on balancing the moments of force).

Task 9.

Misha: (removes 1 weight and observes Masha's actions)

Masha: (moves to line 1. The "Scale" leans to Misha's side. Moves to line 3. The "Scale" leans to Masha's side. Puts on the center of gravity. The "Scale" leans to Misha's side again).

Misha: It's even heavier like this.

Masha: (moves to line 3 and pointing at Misha's weights). One should be removed.

It is significant that in the process of solving task 8, directed speech and gesture communication did not emerge. However, despite the lack of communication, the participants demonstrated orientation not on the individual, but on the joint action. They related the emerging result with the means of cooperating their own actions and by this indicated the relation of factors, determining the balance. Mutual understanding, which emerged in the process of the interaction, allowed these children not only to find the right solutions to the problem, but also to do it in a shorter period of time in comparison with the beginning of the cooperative actions (the number of testing actions decreased).

Later on, however, as the example of solving task 9 shows, the children's joint action broke up, orientation on the individual action and its result became the dominant means of solving the task. At the same time, the results of the second series showed that, in the process of interaction Misha demonstrated signs of the development of attention – he was not distracted by other activities (which he used to do at the very beginning of work in the second phase), he was concentrated on solving the task and controlling the actions that his group-mate was performing. In the course of interaction, a transition to the fourth type of orientation could be detected – in Misha's case that could be seen in the following remarks: "... There're 3 magnets

here, but they moved only one circle, and here there's 1 magnet, but it's in the big circle", "There're 2 magnets in the middle circle, and here there're also two, but in the big circle".

Masha also demonstrated a transition to a new level of understanding the relation of balance. This was reflected in her answers: "In equilibrium. Because there're 3 here, but they're closer to the center, and here there's 1, but it's closer to the edge", "To the left, because there's the same number of them, but these magnets are closer to the edge".

In general, the fact that the children solved the tasks together indicated that the participants understood the possibilities of individual actions and their role in cooperation, which mediated the search for solving the task. At the same time, the analysis of the means of cooperation did not become the focus of the joint action being constructed. Thus, the main goal for these children remained solving the task, based on the relation of the factors of balance.

4. *Meta-cooperative type of "community" ("obstchnost").*

A characteristic trait of this type of "community", distinguishing it from the forms of joint work mentioned above, is the change of the subject of the task. In our case, the very means of interaction between participants became the subject of the task. While engaging in the search for this means, the children went beyond the substantive framework (the "barrier" of substantive content), and perceived the interrelation of the basic factors as a guidance for the joint action that was being constructed. Thus, these children's search for the solution was based on the analysis of a possible means of interaction, which resulted in its transformation and in the emergence of the possibility of solving the task. This point of research might be illustrated by the following example.

Example 5. Lena and Samirghon

Task 1.

Lena: (moves the magnets to line 1)

Samirghon: (adds 1 magnet)

Lena: It will be heavier, you have to remove a few.

Samirghon: (removes 1 magnet, the "Scale" is still tipped to his side).

Lena: Shall you remove one more?

Samirghon: If I remove it, it will fall down... ahhh... yes, I can remove it.

(The problem is solved by applying the rule on balancing the moments of force).

Task. 4.

Samirghon: (looking at Lena and modeling her movement with his hand) I have to remove 2 magnets.

Lena: (simultaneously moving 1 magnet forward and coordinating her actions with her group-mate's actions) OK, remove them (The task is solved by establishing a simple identity)

Experimenter: Are there any other solutions?

Samirghon: Move backwards, and I will add 1 weight.

Lena: (simultaneously with Samirghon) Yes, yes (moves her magnet to line 2)

It is significant that, in this case, mutual understanding, which emerges and develops between the participants, mediated by communication, aimed at the discussion of the interrelation of actions, for each participant, and the possibilities of including these actions into a joint action. The actions, for each participant, were indeed no longer perceived as independent. An exchange of actions acquired a stable character and, consequently, the participants became included into a joint meta-substantive space of searching for a solution, in the framework of which the partner turned into a co-participant of the joint activity. Such verbal traits as appeals to the other and putting spins on the words prevailed in the speech of the participants. Exclamations, discussion of the possible outcomes of joint actions and pointing gestures also emerged. These characteristics of communication indicated the emergence of a "mutual field of meaning" – a new form of joint action ("collective form" in Vygotsky's terms), where the participants elaborated shared meanings and possible "scenarios" of the joint search for the solution.

In general, we could observe that, with the emergence of this form of "community", children made steps in the development of understanding the interrelation between factors, determining the balance of the moments of force. For example, in the second phase in the second individual series, Lena correctly interpreted the interrelation between weight and distance and, though in her answers she only mentioned one of the factors, she correctly solved

the tasks: “To the left, because it’s further and heavier”, “The same, because there are 3 here and 3 there” and they’re at the same distance from the point (meaning the center of the circle). Also Samirghon, in the second individual series, though made errors in the answers, mentioning only one of the factors, was however considering the interrelation of factors in the process of problem-solving, which indicated a new level of understanding of the moments of force (“To side 1, because it’s closer to the edge, and when we were solving with 3 magnets, it was in equilibrium”).

SOME CONCLUDING REMARKS.

While studying the development of higher mental functions (HMFs) in children with SEN in social interactions, we concluded that the premises of such development should be found in the very forms of interaction and in the real relationships that emerge between participants. The results, obtained in the course of this study, allowed us to formulate at least 4 types of child-adult “communities” (“obstchnost”), differing in the processes of communication, mutual understanding and means of interaction, which emerge between participants in the situation of problem-solving. The characteristic traits of the “community” where children are included into the process of joint problem-solving, which distinguishes it from other possible types of bringing participants together, consists of the fact that participants are focused on the very means of interaction. Peculiarities of this “community” are reflected in a targeted search for a joint means of solution: in assessment of the limitations of “their own” actions and the actions of “the other”, in mutual saying aloud and use of symbols (short hands) of the “scenarios” of possible interactions, which might be efficient for solving the problem, and further modeling (symbolic gaming) of such interactions.

Analyzing the received data, we came to the conclusion that the transition from the focus on substantive content of the task to the analysis of the means of interaction in the process of

problem-solving has a particular significance for understanding the source and the mechanisms of the child's mental development. Let us once again turn to the ideas of L.S. Vygotsky and A.R. Luria. Both of these scholars agreed that all higher mental functions and processes are social in origin⁵ - that means, they emerge in the system of social relationships, where each function is originally divided between participants. "Behind all higher mental functions and their relationships stand genetically social relationships, real relationships, homo duplex (a dual person - Latin). From here comes the principle and method of personification in the study of cultural development, that is, division of function between people, personification of functions. For example, voluntary attention – one possesses, the other one acquires. Dividing again in two what had been fused into one, experimental unfolding of a higher mental process (voluntary attention) into a small drama"⁶ [Vygotsky, 2005, p. 1023]. Social interactions determine the mechanism of the division of functions, on the one hand, and the means of their acquisition – on the other. This means that the social interactions and the social relations of the participants, which originally serve as a necessary condition for the social realization of the processes of thinking and communication, start later to perform the function of self-regulation and mental representation of various kinds of information. These interactions boost the development of cognitive functions, which are not yet developed, allowing children to act on a higher cognitive level.

There is yet one significant circumstance that has to be taken into consideration while discussing the processes that influence inclusion into the situation of social interactions, particularly in children with SEN. It is important to highlight that the change of the subject of the task, which emerges in social interactions, does not indicate exclusively the change in the subject of action. For children, this change is connected with the emergence of a new problem. The necessity of solving this new problem, therefore, triggers a new motivation, which prompts

⁵ L.S. Vygotsky used the term "genetically social" (from Lat. "genesis").

⁶ Translated by authors.

the children to organize joint actions and search jointly for a solution. Following this motivation, the participants discuss emerging limitations and model necessary exchanges, developing communication and modeling the directions of possible interactions.

In these conditions, a shared emotional-meaningful field emerges, based on the participants' mutual understanding and their emotional experience ("perezhivaniye") of the new possibilities and their understanding of the sense of the actions that they perform. The importance of the emerging "perezhivaniye" in the development of activity was particularly emphasized by A.N. Leontiev, who argued: "These forms of perezhivaniye are the forms of the subject's relation to the motive..." and "This conscious relation of the subject of action to its motive is the sense of action; the form of perezhivaniye (experience) of the sense of action is the awareness of its aim... The change of the sense of action always means a change of its motivation" [Leontiev, 1994, p. 48-49].

SUMMARY

In summary, the results presented in this chapter highlight the significance of social interactions in the development of higher mental functions and shed light on the issue of including children (particularly with SEN) into the process of joint problem-solving. There are strong grounds to believe that it is the emerging motivation, determined by the necessity to perform new interactions, that gives the impulse for the change of the social situation. The activity in this situation is based on the new meanings and relations to the performance of one's own actions and the actions of the other participants, as well as on emotional experience (perezhivaniye) and mutual understanding of these new meanings. With the emergence of a new motivation, for a child, who has limitations in performing certain actions, new possibilities emerge, and, therefore, new boundaries for individual actions. As a result, children try to plan

new scenarios and come to new agreements concerning the real interactions, as well as to model new means of joint work.

Including children with special educational needs and normally developing children into joint learning activity is a necessary condition for the development of their higher mental functions, as well as a necessary condition for organizing inclusive education.

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