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традиции и инновации

Cultural-Historical Psychology:
Traditions and Innovations

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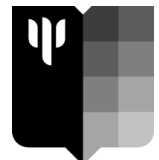

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Cultural-Historical Psychology: Traditions and Innovations

Guest Editors: K. Plakitsi, O.V. Rubtsova

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Editors' Foreword

This volume represents the second part of the special edition, which is the result of collaboration between the International Society of Cultural Historical Activity and Research (ISCAR) and Moscow State University of Psychology and Education (MSUPE). The special issue aims at giving a snapshot of the diversity of fields and contexts, in which Cultural-Historical Theory and Activity Approach are nowadays applied by scholars and researchers all over the world. The articles in the second volume focus on such aspects as joint activity, scaffolding, the relationship between the subject and the object of the activity, ways of transferring L.S. Vygotsky's Experimental-Genetic Method into Science Education and furthermore, into non-formal settings. The volume also highlights strategies of engaging teachers in learning with Communication Technologies via Massive Open Online Courses, as well as on applying Vygotsky's concept of Higher Mental Functions (HMF) in educational practices, especially in the case of students with disabilities. Both volumes touch upon a broader spectrum of problems connected with learning and development in the context of social interactions.

The two parts of the special edition invite to an open dialogue in the socio-cultural field of research building a ground for further discussion on the platform of the Journal: "Cultural-Historical Psychology" and the forthcoming ISCAR Congresses in Brazil (2021) and in Russia (2023). The academic community expands its boundaries and collaboration living under the pandemic.

This special issue is dedicated to the memory of Elena Evgen'evna Kravtsova — Russian psychologist, founder of L.S. Vygotsky's Institute in the Russian State University for the Humanities, granddaughter of L.S. Vygotsky. She passed away on March, 28th, 2020.

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Two Approaches to the Problem of Development in the Context of Social Interactions: L.S. Vygotsky vs J. Piaget

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The article is devoted to the problem of development and learning in the context of social interactions. This question is investigated on the basis of the analysis of the theoretical views of L.S. Vygotsky and J. Piaget. Both J. Piaget and L.S. Vygotsky substantiated the impact of social interactions and socialization on the development of the child's thinking, and emphasized the close connection between the development of the child and the forms of interaction between the child and adults, as well as with other children. Two different approaches to understanding the child's developmental paths are considered in the paper: one — from the individual to the social (J. Piaget) and the other — from the social to the individual (L.S. Vygotsky). Two different developmental mechanisms, based on the interactions and relationships of the participants of the social situation, are discussed: "socio-cognitive conflict" (J. Piaget) and "emotional-semantic" ("affective-semantic") conflict (L.V. Vygotsky). Two possible models of designing educational environments, effective for the development of children in the learning process, are described in the paper: a model based on role exchanges and children's cooperation ("School of J. Piaget"), and a model, based on developing forms of child-adult communities and activities ("School of L.S. Vygotsky").

Keywords: development, learning, social interactions, socio-cognitive conflict, emotional-semantic conflict, community ("obschtnost"), understanding, mutual understanding, reflection, means of interaction, thinking, "pereghivanije".

The basic tenets of the theory of J. Piaget[1]. The scientific school of J. Piaget considers the formation of intelligence as the pivotal line in the mental development of a child, which determines the development of all other mental processes. According to J. Piaget, the qualitative uniqueness of each stage of cognitive development, as well as leaps and transitions, made from one age level to another, are all determined by the in-life formation of structures of intellectual activity, which are age-specific.

The fundamental idea of development in the theory of J. Piaget consists in the fact that intellectual operations are carried out in the form of integral structures. These structures are formed due to the equilibrium, which the general development of intelligence strives to achieve. The Geneva School of Genetic Psychology, created by J. Piaget and his followers, studies cognitive development of the child, and, in fact, the origin of intelligence. The main task of this scientific school is studying children's concepts about natural phenomena, describing peculiarities of children's logic and, as a result, substantiation of the mechanisms of cognitive activity in general. The fundamental answers, found in J. Piaget's works regarding the development of the operational structures of children's thinking, constitute the core of the Geneva scientific school.

In general terms the basic tenets of the theory of J. Piaget can be formulated with the help of these four axioms:

1. Intelligence is constructed on the basis of action.
2. Action is the source of development.
3. Thought is a condensed form of action.
4. Cognition at all genetic levels is a product of real actions performed by the agent (subject) with objects.

While substantiating these ideas, Piaget proceeded from the fact that the object(s) exist(s) independently of the agent. In order to acquire knowledge about the objects, the agent must act with them: bind, separate, move, change, combine, i.e. *transform* them. Development takes

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[1] A well-known Russian psychologist L.F. Obukhova undertook a thorough analysis of the main principles of the theory of J. Piaget (see e.g. [7], [8]).

place on the basis of real actions performed by the agent with the objects of the external world. Moreover, the description of the agent's interaction with the object cannot be completely captured by the formula S→R (unidirectional arrow). From Piaget's perspective, the essence of subject-object interactions is most fully represented in the formula S↔R (reversible arrow), which captures the reversible character of this relationship.

The content of the agent's interactions with objects and the reversible character of these relationships reflect Piaget's ideas about transformation and construction. Thus, the idea of *transformation* indicates the fact that the boundary between the agent and the object is not established from the very beginning, and that in every action the subject and the object are mixed. The idea of *construction* presupposes that objective knowledge is subordinate to certain structures of action. Moreover, the structures of action are given neither in the objects, nor in the agent, since the agent must learn to coordinate their actions.

The most general content, which is preserved in the action, is characterized by a *scheme of action*, which, according to J. Piaget, is a structure at a certain level of cognitive development, and in a narrow sense, a sensorimotor element of the concept. Relying on the concept of the scheme of action, Piaget introduces a fundamental difference between the form and the content of cognition. In his theory, the content of children's cognition represents something, which is acquired through experience and observation, while the form of cognition is the "general scheme" of the agent's thinking activity, in which the agent's interactions with the objects are included. It is not the object per se that plays the main role in the process of cognition: the agent him or herself chooses the object depending on the level of the development of intellectual structures. Thus, the process of cognition ("acquiring knowledge" about the reality) depends on the development of intellectual structures.

J. Piaget describes three main forms of experience that determine the development of intellectual structures [12]:

• *Experience-exercise* that is important for building a skill.

• *Physical experience*, due to which the child, while interacting with objects, begins to distinguish the physical properties of objects (shape, weight, volume, area, etc.).

• *Logical and mathematical experience elicited by a child from the actions with objects.* It is characterized not only by the orientation on a pragmatic result, but also on the means of action itself, which constitutes a necessary condition for the development of intelligence. Logical and mathematical experience is crucial for the development of intelligence and designates a higher level of mental development.

The law of intellectual development in the theory of J. Piaget. One of the main discoveries of J. Piaget is the discovery of the egocentrism of children's thinking. According to Piaget, *egocentrism* is the main feature of thinking, a hidden intellectual position, which reflects the peculiarities of children's logic, children's speech and children's vision of the world. In numerous research works, conducted in the framework of Piaget's scientific school, egocentrism is defined as a kind of systematic and unconscious illusion of cognition, as a form of the initial centering of the mind, which characterizes mental activity in its origin. Egocentrism points to the fact that the external world does not directly affect the agent's mind, and that our knowledge of the world is neither a copy, nor a simple display of external events.

The basic law of mental development in the theory of J. Piaget is the law of *decentration*, the law of transition from general egocentricity to intellectual decentration, which is expressed in the child's transition from egocentrism to an objective position in acquiring knowledge about things, other people and him/herself. Importantly, according to J. Piaget, the key provision that determines the essence of the law stated above, is that the transition from egocentric to an objective position underlies the process of socialization, that is, the transition from the individually subjective to the social. J. Piaget believes that the thought is formed on the basis of action, but the source of integral logical structures (the development of individual intelligence) should be sought in the socialization of the individual [13], [14].

In the theory of J. Piaget *socialization* is regarded as a process of adaptation to the social environment, consisting in the fact that a child, who has reached a certain level of intellectual development, becomes able to cooperate with other people, because he or she already distinguishes his or her own point of view and coordinates it with those of other people. *Social life* starts playing a progressive role in the development of the mind only at those stages, when relations of cooperation develop, as well as debates and discussions with peers emerge. This turning point in development takes place at the age of around 7—8 years. Before this age, the leading role in a child's development belongs to the relations with adults, which, as J. Piaget emphasizes, are built primarily on the basis of unilateral respect and authority of the adult.

According to J. Piaget, "at the pre-operational levels, extending from the appearance of language to the age of about 7—8 years, the structures associated with the beginnings of thought preclude the formation of the co-operative social functions which are indispensable for logic to be formed. Oscillating between distorting egocentricity and passive acceptance of intellectual suggestion, the child is, therefore, not yet subject to a socialization of intelligence which could profoundly modify its mechanism" [13, p. 162]. Therefore, it is precisely at the stage of the formation of concrete operations that the problem of correlation between the influence of social exchange and the impact of individual structures on the development of thinking arises in acute form.

Revealing the content of the process of socialization, Piaget points out, that while interacting with adults and peers, children aged 7—8 years experience a *sociocognitive conflict,* when the point of view of other people becomes significant and needs to be taken into account as children perform their own actions. The point of view of the other is correlated with the child's position, and is taken into account and included in the process of constructing an action; it is fixed in the emerging scheme of the action, and becomes a condition for the development of the emerging groupings (Fig. 1).
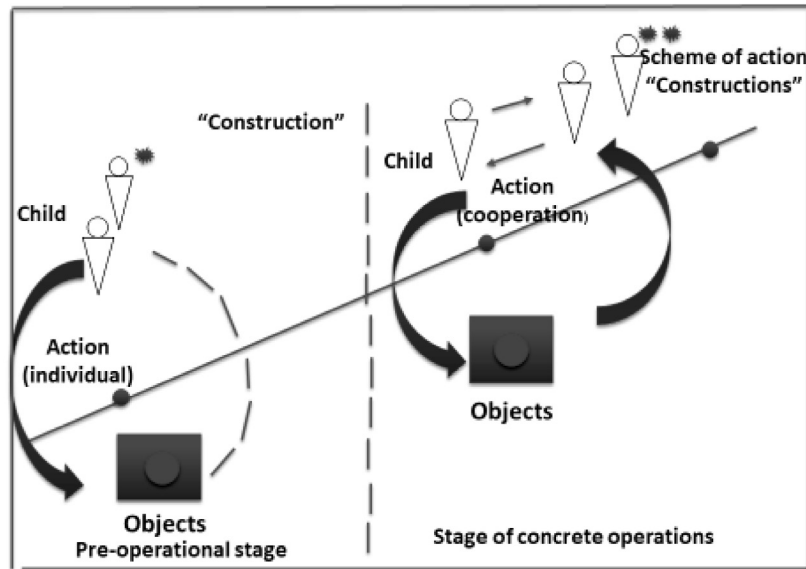
Fig. 1. Socio-cognitive conflict as a mechanism of development of individual intelligence in the situation of cooperation
(an asterisk indicates the acts of reflection that emerge during the execution of an action as described by J. Piaget:
* — reflection on the properties of object
** — reflection on the means of action)

In the theory of J. Piaget, the isomorphism of operational structures and structures of cooperation is considered as a consequence of the more general law of the development of groupings. According to Piaget, each grouping, internal for an individual, is a system of operations carried out jointly, that is, in the proper sense, cooperation. This form of equilibrium is not the result of solitary intellectual thinking. Internal operational activity and external cooperation represent two corresponding processes, and the equilibrium of the one depends on the equilibrium of the other.

Intellectual development in the context of social interactions in the theory of J. Piaget. The analysis makes it possible to articulate the general principles of cognitive development in the theory of J. Piaget, emphasizing the special role that social interactions play in this process. According to J. Piaget:

1. The basis of human intellectual development (the development of thinking) is a qualitative change in the forms of experience, based on the performance of one's own actions.

2. The means of performing individual actions in the conditions of S⇄O interactions are the emerging structures ("knowledge" about the object and the structures of action subordinate to it).

3. The invariants of action (reflected experience) take shape of action schemes (an action scheme is a structure at a certain level of mental development, a mental system or integrity, whose principles of activity are different from those of the activity of its parts).

4. Cooperation (collaboration) allows to fulfill the correct transfer of a concept, starting from the stage of concrete operations. The condition for such a transfer is a socio-cognitive conflict — a new type of relationships between agents, that replaces the relationships of prestige and authority characterizing the pre-operational stage of cognitive development.

5. Socialization of the individual intelligence (the transition from the individually subjective to the social) is the main direction of cognitive development. Socialization is impossible without cooperation and collaboration, without including individuals into the actions of various "communities".

Conventionally, the scheme of socialization of the individual intelligence, as it is presented in the theory of J. Piaget, is shown in Figure 2.

A few recent studies, conducted in the framework of the scientific school of J. Piaget, focuse on the perspective that the scholar had on the isomorphism of operational structures and structures of cooperation. Thus, in the last few years there has been an increasing interest for the issue, whether social interaction stems from some form of assistance that could precede cooperation and influence the development of thinking, and whether this kind of assistance ("co-action") could be regarded as a source both of social and cognitive development, the detemining condition for which it could possibly be?

Recognition of this provision would mean that the social environment affects the child's development from the moment of birth. Moreover, recent data allow researchers to argue that the social factor plays the leading role in the emergence of a child's ability to act consciously, to consider communicative actions as special forms of social interactions. A special analysis of communicative interactions at an early age made it possible, in particular, to say that "just as a child's visual acquaintance with the details of the environment arises within the innate orientational movements, a smile manifests itself as a specific element of its innate communicative activity. Mothers are sensitive to the totality of the communicative actions of the child, and not to just a smile: but even when the child cannot make the smile recognizable, his mother knows how to see his sociability" [24, p. 452]. Recently, an increasing num-
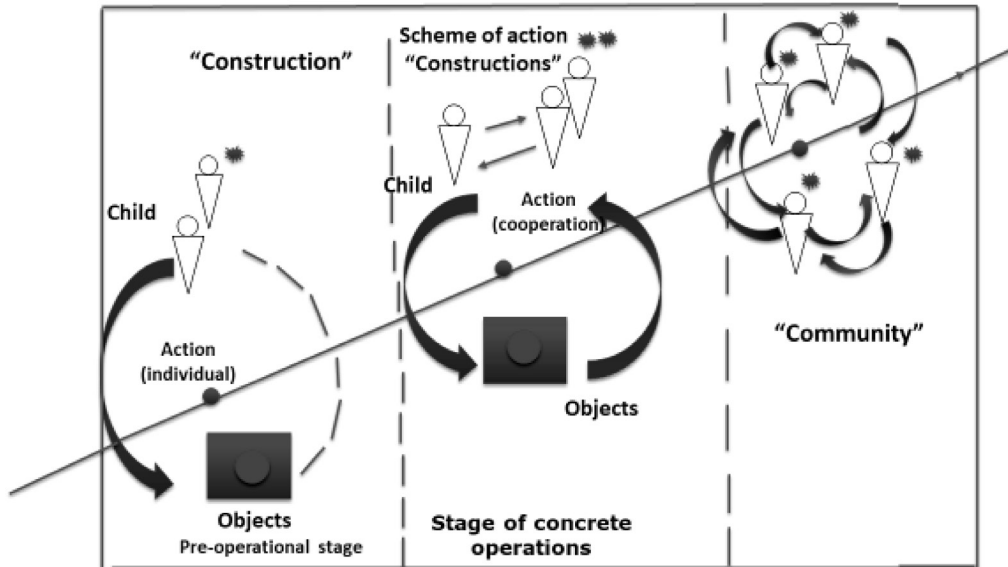
Fig. 2. Socialization of the individual intelligence (in the theory of J. Piaget)

ber of followers of the scientific school of J. Piaget have come to this conclusion [15], [24], [25].

The role of social interactions in the development of children's thinking in the scientific school of L.S. Vygotsky. The law of development of higher mental functions. It is obvious, however, that the question of the double-facet nature (isomorphism) of intellectual structures and structures of cooperation will remain open unless the very approach to the problem of development is fundamentally revised. The foundations of this approach were laid in the scientific school of L.S. Vygotsky.

As we know, L.S. Vygotsky considered social interactions and social relations as the initial basis (source) of development. "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"*[2] [27, p. 1023 — emphasis added by *V.R.*].

L.S. Vygotsky came to this conclusion due to the results of widely known experiments with children on acquiring (mastering) attention (Fig. 3). An adult puts
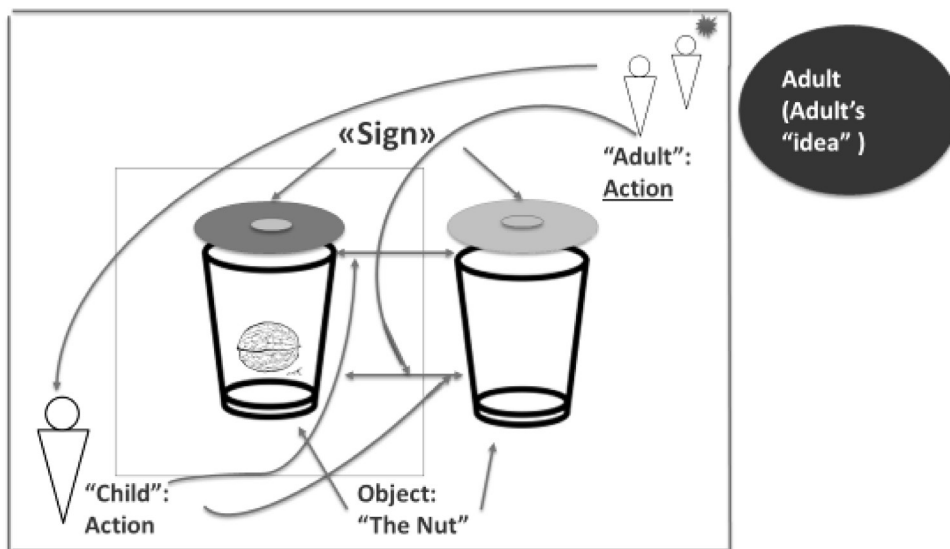
Fig. 3. Scheme of development of attention in a situation of "child — adult" interaction in L.S. Vygotsky's experiments (the process of reflection is conventionally designated with an asterisk)

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[2] Translated by V.V. Rubtsov.

two cups covered with lids in front of the child. The adult puts (hides) a nut in one of them. The lids are painted in different colors (dark-gray or light-gray). A lid of a darker color always covers the cup, where the nut is. The color ratio on the lids changes depending on the location of the nut. The *idea (plan)* of the adult is to draw the child's attention to the correspondence of the object's (the nut) location and the corresponding sign (light gray/dark gray). In this Vygotsky's experiment the child was to acquire the adult's attention, represented through the ratio of subject structures and sign structures. This was achieved via mediation of the object structures and sign structures on the basis of the unfolding interactions and relationships between the child and the adult.

The process of mastering (acquiring) a mental function as being initially distributed between the participants of the social situation L.S. Vygotsky formulated in general terms in the well-known law of the development of higher mental functions, according to which "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"[3] [26, p. 145].

The idea of acquiring (mastering) a function as initially divided between the adult and the child was most fully implemented in the method of double stimulation developed by L.S. Vygotsky and L.S. Sakharov. This method is a prototype of the genetic modeling approach elaborated by L.S. Vygotsky for studying the development of higher mental functions. A particular technique allowed them to study in experimental settings the process of the formation of concepts as the process of meaningless words acquiring meaning, as a process of words turning into a symbol, into a representative of an object or a group of similar objects (see.: [29], [30]).

For L.S. Vygotsky it was essential to show that concept formation or meaning acquisition by a word is the result of a complex joint child-adult activity (that includes operating a word or a sign), in which all the basic intellectual functions are included in a peculiar combination. Thus, individual consciousness represents a product of the internalization of this activity. «... The transition *(from interpsychic functions to intrapsychic ones, that is, from the forms of a child's social collective activity to their individual functions —* added by V.R.) is a common law ... for the development of all higher mental functions that primarily emerge as forms of activity in cooperation and only then are transferred by the child into the area of their psychological forms of activity.... *It is not gradual socialization, which is introduced into the child from the outside, but the gradual individualization, emerging on the basis of the child's internal sociality, that is the main path of the child's development*"[4] [28, p. 343—344, emphasis by V.R.].

Learning and development in the context of social interactions: challenges that L.S. Vygotsky brought up. The stages of the development of individual consciousness from the forms of collective-social activity, indicated by L.S. Vygotsky, were precisely described by V.V. Davydov (Fig. 4). The individualization of consciousness, in the interpretation of V.V. Davydov, represents a culturally significant result of mastering of initially collective-social forms of activity. In this process signs and symbols act as necessary cultural means of organizing individual human consciousness.

Analyzing L.S. Vygotsky's approach to the role of social interactions in human development, V.V. Davydov identified six main issues, brought up by L.S. Vygotsky's scientific school. A more detailed analysis of these fundamentals allows to understsnd more deeply the nature of the development of higher mental functions [1].

So, according to V.V. Davydov:

1. The basis for the development of a human being is represented by a *qualitative change in their social situation* or, in A.A. Leontiev's terms, *a change in human activity.*
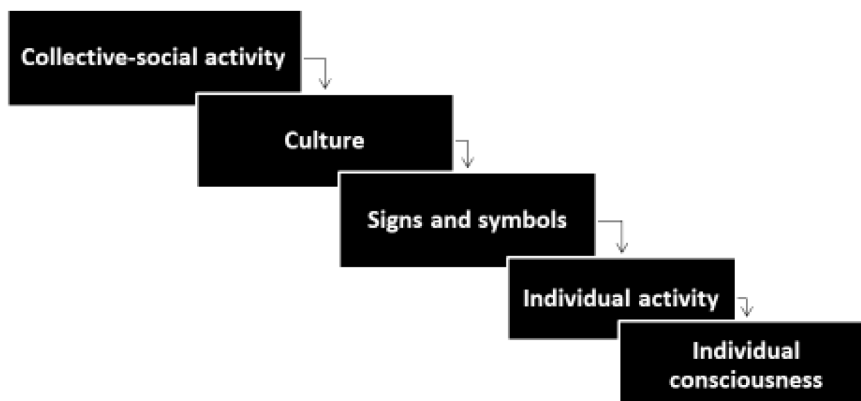

Fig. 4. Stages of development of individual consciousness from the forms of collective-social activity
(according to V.V. Davydov)

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[3] Translated by V.V. Rubtsov.
[4] Translated by V.V. Rubtsov.

2. Universal aspects of human mental development are their learning and education ["obutchenije" and "vospitanije"] (according to L.S. Vygotsky, "education ["vospitanije"] is valuable while it is ahead of development").

3. The initial form of activity is its full-form execution by the person on the outer — social, or collective — plane.

4. Psychological neoformations (new formations), which emerge in a human being, are derivative from the interiorization of the initial form of human activity.

5. Significant role in the process of interiorization belongs to different sign and symbol systems.

6. An important part in the activity of human consciousness belongs to the internal unity of intelligence and emotions.

Socio-genetic method of research of development. The provisions, that constitute the basis of L.S.Vygotsky's Cultural-Historical Scientific school, are indicated by V.V. Davydov as unsolved problems of the Activity Theory, and allow to investigate the mechanisms of the development of thinking in a new way, connecting these mechanisms to qualitative changes in the social situation, which are determined by changes of the forms of joint collective activity. While designing such kind of developmental settings, it is important to take into consideration the following:

1. The study of social interactions and the process of mastering (acquiring) concepts cannot be reduced to studying them simply as parallel processes.

2. Method of experimental research of the process of concept formation should be *socio-genetic* (*compare with L.S. Vygotsky's "genetic modeling method"*). This method underlies the principle of *mutual mediation* of subject structures and structures of joint activity: the subject content of the object, which determines the content of the concepts acquired, is mediated by the means of interaction of the participants of social situation.

3. The organization of child-adult and child-child interactions is a necessary condition for the implementation of joint actions, since interactions and relationships of the participants determine their understanding of the relationships between various actions with the object, the properties of the object's structure and relevant concepts.

4. The method of joint actions, which corresponds to the system of the concepts acquired, characterizes the basic didactic unit that defines the requirements for organizing the social situation.

5. It is necessary to specifically explore and design social situations, based on mediation of the object's subject content by the means of interaction of its participants; it is also necessary to analyze the emerging child-adult communities and joint forms of activity, considerimg them as the initial forms of origin and development of emotional-semantic and symbolic-semantic structures that determine the process of mastering of the system of concepts.

It is important to highlight that socio-genetic method is grounded in the fundamental principles of the Cultural-Historical Scientific school, according to which the relationships and interactions of participants of a social situation determine the conditions for the development of child-adult communities ("obstchnost")[5] and the corresponding forms of joint activity (see [16], [17]).

Numerous studies based on this method, apply a system of techniques, which made it possible to obtain new data on the impact of social child-adult and child-child interactions on the development of children's thinking as well as to prove that these relationships influence the success of education (see [3], [6], [19], [22]). In particular, it was found that emerging child-adult communities are characterized by:

• the distribution of initial actions and operations (determined by a group of transformations that provide participants' search for a general means of constructing the object under study);

• the exchange of means of action (determined by the necessity to include individual actions in new means of interaction);

• communication; distribution and exchange of actions are impossible without communication; it is due to communication that participants plan (design) the conditions, adequate for the realization of activity, and seek for joint means of activity;

• mutual understanding, conditioned by the necessity to include individual means of the participants' action into a joint activity (allows to establish the ratio of the possibilities of one's own actions and actions of other participants in the activity);

• reflection, which underlies the participant's attitude to their own action (limitations and opportunities), which determines the boundaries for transformation of this action, and which is the basis for initiatiating (modelling) the search of new forms of interaction and cooperation.

Moreover, the results of recent studies, obtained by applying the developed method, have confirmed the fact 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 ("obstchnost"), which determines the new framework of the possibilities of development of higher mental functions in children [17], [18]. The analysis of the recently collected data allowed to identify 4 types of communities ("obstchnost") [20]:

• *pre-cooperative* — there is no interaction between participants; children are not involved in the joint search for a means of solving the problem;

• *pseudo-cooperative* — interaction between participants is substituted by actions of one of the participants; in some cases, the task is solved by one participant (individually);

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[5] 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 is used in this paper.

• *cooperative (organizational)* — 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;

• *meta-cooperative (reflective-analytical)* — 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.

Thus, the community, where children are included into the joint process of problem-solving on the basis of collaboration and cooperation, mainly differs from other possible forms of uniting the participants, in the fact that the participants are focused (oriented) on the means of interaction itself. Characteristic traits of this type of orientation in children are revealed in a targeted search for a joint means of problem-solving, which is expressed in assessing the limitations of their *own* actions and the actions of *the other*, in joint talking through and conventional illustrating (designating) scenarios of possible interactions that can be effective for problem-solving, and in the subsequent modeling (gaming) of such interactions [17], [23].

In the conditions of a *meta-cooperative (reflective-analytical) type of community,* that has been indicated on the basis of research, the aim of communication consists in the participants' discussion of the very possibilities of including individual actions into a joint action. In this type of community, the search for a correct solution of a problem by the participants is transformed into the task of interaction and determines a joint means of solution. Mutual understanding is mediated by the search for a means of interaction, based on the understanding of the possibilities of individual actions in a joint action. The inclusion of individual actions into a joint action becomes the main goal of interaction for these participants. Due to this, prerequisites are created for the development of

new relationships and, as a result, for the emergence of a new social situation with different goals and objectives.

Data also shows that in *the cooperative (organizational) type of community* that has been indicated, the participants' understanding of the possibilities of individual actions and exchange of actions is connected with problem-solving. However, the emerging communication is not oriented at a joint search for the very means of solving the problem, and the analysis of the means of interaction does not become the goal of joint action for these children. In this type of community, it is important for participants to solve the problem, rather than to figure out how to organize the interaction between themselves.

In general, our data confirms once more the idea that, on the one hand, social interactions determine the mechanism of the division of functions, and, on the other hand, the means how they are acquired (mastered). This means that the participants' social interactions and social relationships, which initially serve as a necessary condition for the social realization of the processes of thinking and communication, later on begin to play the role of the cognitive function of self-regulation and of mental representation of certain information. These interactions activate cognitive functions that are not yet developed, which allows children to act at a higher cognitive level. Thus, a special mechanism of development in a social situation — *the emotional-semantic (affective-semantic) conflict* — can be indicated, that arises in the context of interactions and relationships of the participants of the social situation.

Figure 5 shows a diagram of child—adult social interactions, contributing to the emergence of an emotional-semantic (affective-semantic) conflict, which determines a change in the social situation due to the emergence of new motives and goals of the participants of the social situation. This type of interaction indicates fundamentally different conditions for the origin of thought than those denoted in the socio-cognitive conflict described in the theory of J. Piaget. It also emphasizes the originally social nature of the development of higher mental functions.
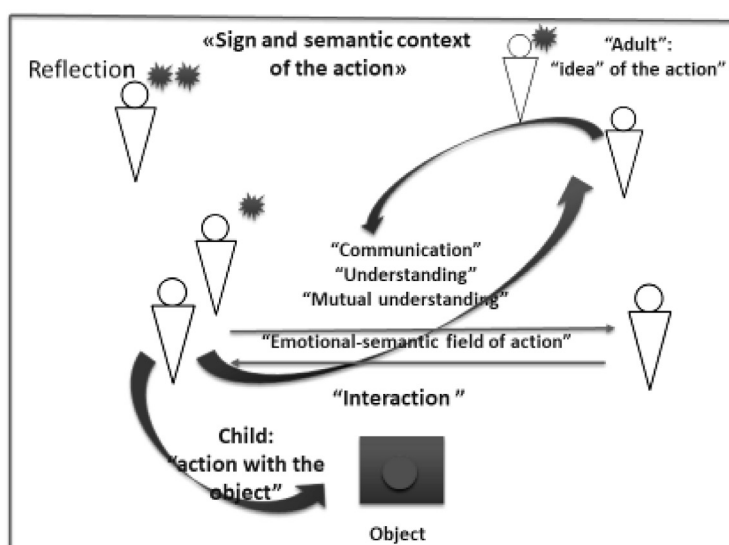

Fig. 5. Emotional-semantic (affective-semantic) conflict as a mechanism for changing the social situation

The data received allows us to discuss the question of sources of development in a fundamentally new way, based on the affective-semantic (emotional-semantic) conflict. First, there are strong grounds to believe that the change in the subject of the problem that occurs in social interactions creates prerequisites for changing the subject of the action. This change is associated with the emergence of a fundamentally new task for children to search for the very means of action. The need to solve it launches a new motivation that encourages children to organize joint actions and to search for a solution jointly. Following this motivation, participants discuss emerging constraints and design the necessary exchanges, strengthening communication and modeling means of possible interactions.

A shared *emotional-semantic (affective-semantci) field, based on the participants' experience of new opportunities and understanding of the sense of actions that they perform*, emerges in these conditions. As is known, the special role of the experience ("perezhivanije"), emerging in the development of activity, was particularly emphasized by A.N. Leontyev, who wrote: "These forms of experience [pereghivanije] are the forms of reflection of the agent's attitude to the motive <...> This conscious attitude of the agent of the action to its motive is the meaning of the action; the form of experience (becoming aware) of the meaning of an action is the awareness of its goal … A change in the meaning of an action is always a change in its motivation"[6] [5, p. 48—49]. The results of research also testify that a change in activity in a social situation, based on the emotional-semantic conflict, occurs due to the emergence of new meanings and new attitudes to the fulfillment of one's own actions and actions of the other participants. This happens through "perezhivanije" (*experiencing)* of *these meanings, understanding* them and *sharing mutual understanding*. The latter becomes a prerequisite for the emergence of new motives for activity in children. With the emergence of a new motivation, new goals and opportunities appear for the child and, therefore, new boundaries for individual actions in the context of interaction with others, appear. Children begin to jointly (together) plan new scenarios, and achieve meaningful agreement on the real interactions, as well as to design new means of joint work.

In general, the data obtained, shed a new light on the role of social interactions and social relationships in the development of children in learning, and allows to face the problem of designing educational environments as spaces of developing child-adult communities and, essentially, to redefine the requirements for a contemporary school.

The school that teaches to think: "school of L.S. Vygotsky" vs "school of J. Piaget". The analysis of the problem of learning and development in the context of social interactions, presented in two major scientific theories of L.S. Vygotsky and J. Piaget, allows us to discuss in a very general way the issue of an effective model of con-temporary school as the school of development. This discussion is based on the views that the two prominent scholars had on the sources and mechanisms of human development, particularly, on the idea that actions with objects and social interactions are *interconnected* — these are not parallel processes, but a means (way) of transferring knowledge and concepts mediated by forms of joint-ly-collective activity. At the same time, it is legitimate to speak both of similarities and differences in the scholars' approaches. "Piaget's School" of action and space for acquiring various forms of experience is to some extent alternative to "Vygotsky's School", based on developing forms of child-adult communities and types of activity. In general terms, the difference is reflected in the following conditional characteristics of the models of both school types.

1. *The school that "teaches to think" (some definitions from the project "School of J. Piaget"):*
• School of action (space for active transformation and construction).
• School of acquiring various forms of experience (exercise — physical experience — logical and mathematical experience).
• School of development of intelligence (forms of intellectual activity), which ensures the process of decentration of children's thought and the formation of intellectual structures (schemes / models / groupings).
• School of social experience, based on role exchanges and children's cooperation in solving problems and tasks (starting from the level of concrete operations).

2. *The school that "teaches to think" (some definitions from the project "Vygotsky's School"):*
• School based on developing forms of child-adult communities and activities.
• School for implementation of age-related opportunities and development of motivation ("school of ages").
• School based on contemporary (cultural) means of organizing communication and activities (subject-content environment, "smart digital environment", etc.).
• School of the development of abilities for
— interaction and cooperation;
— communication and understanding (mutual understanding).
• School that ensures the development of reflective forms of consciousness (from social-collective to individual through the formation of sign-semantic contexts).

The requirements for the models of two types of schools, presented in the broadest possible terms, are based on the fundamentals of the two leading theories of human development, and should be taken into account while designing educational spaces and creating effective means of organizing joint activities of children and adults, and, as a result, while organizing motivating child-adult communities that promote children's development in the process of learning [4], [21].

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[6] Translated by V.V. Rubtsov.

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Два подхода к проблеме развития в контексте социальных взаимодействий: Л.С. Выготский vs Ж. Пиаже

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Статья посвящена проблеме развития и обучения в контексте социальных взаимодействий. Этот вопрос рассматривается на основе анализа теоретических взглядов Л.С. Выготского и Ж. Пиаже. И Ж. Пиаже, и Л.С. Выготский указывали на тесную связь развития ребенка с формами взаимодействия взрослого и детей, кооперацией самих детей, обосновывали влияние социальных взаимодействий и социализации на развитие детской мысли. Рассматриваются два различных подхода к пониманию путей развития ребенка — от индивидуального к социальному (Ж. Пиаже) и от социального к индивидуальному (Л.С. Выготский). Обсуждаются два различных механизма развития, основанные на взаимодействиях и взаимоотношениях участников социальной ситуации, — «социо-когнитивный конфликт» (Ж. Пиаже) и «эмоционально (аффективно)-смысловой конфликт» (Л.В. Выготский). Описаны две возможные модели проектирования развивающих образовательных сред, эффективные для развития детей в обучении — модель, основанная на ролевых обменах и детской кооперации («Школа Пиаже»), и модель, основанная на развивающихся формах детско-взрослых общностей и деятельностей («Школа Выготского»).

Ключевые слова: развитие, обучение, социальные взаимодействия, социо-когнитивный конфликт, эмоционально-смысловой конфликт, общность, понимание, взаимопонимание, рефлексия, способ взаимодействия, мышление, переживание.

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Zone of Proximal Development, Scaffolding and Teaching Practice

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The construction of the zone of proximal development (ZPD) in the context of teaching activity is discussed in the paper. ZPD is compared and contrasted with the concept of scaffolding as introduced by Jerome Bruner. In the context of its potential for operationalisation in the form of teacher activities, the author examines key ZPD content given by Lev Vygotsky in terms of the complex interaction of spontaneous (everyday) concepts formed prior to the beginning of school education with scientific (theoretical) concepts formed during schooling. Vygotsky's main idea about the leading role of scientific concepts in the restructuring of previously formed spontaneous concepts, as well as in the development of the child's holistic thinking, leads to the conclusion that it is possible also to directly influence the spontaneous formation concepts change through the organisation of collectively distributed forms of educational activity and in a polylogue based the Socratic method. The leading psychological processes, which ensure the development of spontaneous concepts through their greater generalisation and awareness, comprise the processes of exteriorisation of spontaneous concepts, reflection and subsequent interiorisation of a collectively constructed concept. Therefore, the activities of teaching in constructing a ZPD include providing conditions for the distribution of individual operations in the course of a joint learning action and facilitating a polylogue to ensure the effective functioning of these psychological processes in the course of specifically organised learning activities.

Keywords: zone of proximal development, scaffolding, cultural-historical psychology, Vygotsky, teaching.

Introduction

In the context of child development, one of the most cited concepts in Lev Vygotsky's cultural-historical psychology is the zone of proximal development (ZPD). ZPD continues to arouse research and practical interest due to its role in constructing a model of education that is aimed at developing a student's thinking and personality rather than memorising and reproducing information [7].

Figs. 1—2 present the number of publications per year on the topic of ZPD in the international (Web of Science Core Collection, WoS CC) and national (Russian Science Citation Index, RSCI) abstract databases of scientific publications in 2000—2019.

The total number of publications in the Web of Science Core Collection referencing the ZPD concept for the period 2000—2019 was 830.

As can be seen from Fig. 2, the total number of publications in the Scientific Electronic Library eLibrary.ru, containing the concept of the zone of proximal development (ZPD) for the period 2000-2019 accounted for 2600.

However, there are only few practical examples of the implementation of the ZPD concept in in educa-

tional practice. The list of successful attempts to create such a learning model consists of the system of developmental education developed by Daniil Elkonin and Vasily Davydov for elementary school students, and a number of preschool education curricula based around ZPD include "Development" (*Razvitiye*), "Golden Key" (*Zolotoy Klyuchik*) and "Tools of the Mind". The attempt at a mass transition to an activity-based methodology aimed at developing the thinking and personality Russian school pupils as part of the development of a new state standard for general education (2009) did not yield the desired transformation. "Traditional" subject teaching, based primarily on training pupils' memory capacity, continues to be carried out in the majority of classes in Russian schools, while genuine goals of education are reduced to the need to pass the unified state exam. Such results naturally raise the question as to why previous attempts to introduce ZPD development-based approaches into education have mostly been unsuccessful.

In our opinion, the answer to this question is connected, first of all, with the fact that neither Vygotsky nor his followers offered a clear and understandable (specifically to teachers) model of teacher activity to construct

Number of publications per year (WoS CC)
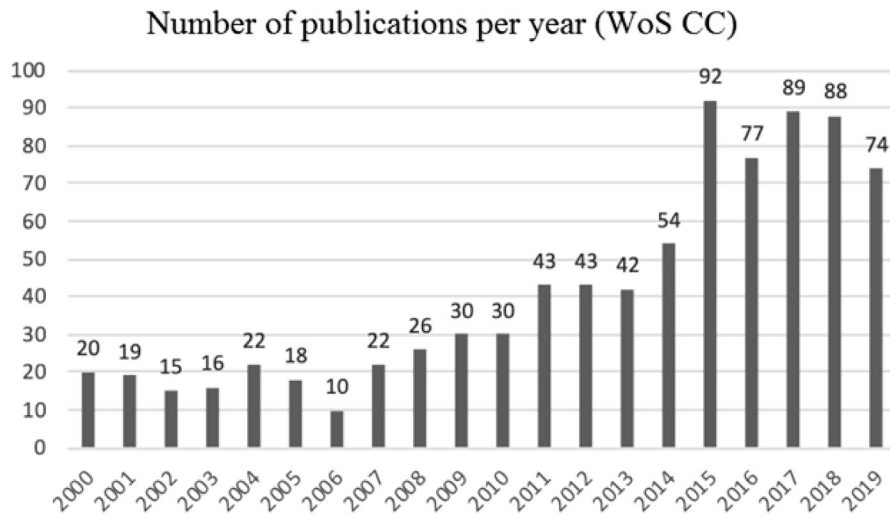
Fig. 1. Number of publications on the topic of ZPD in 2000—2019, Web of Science Core Collection (WoS CC)

Number of publications per year (RSCI)
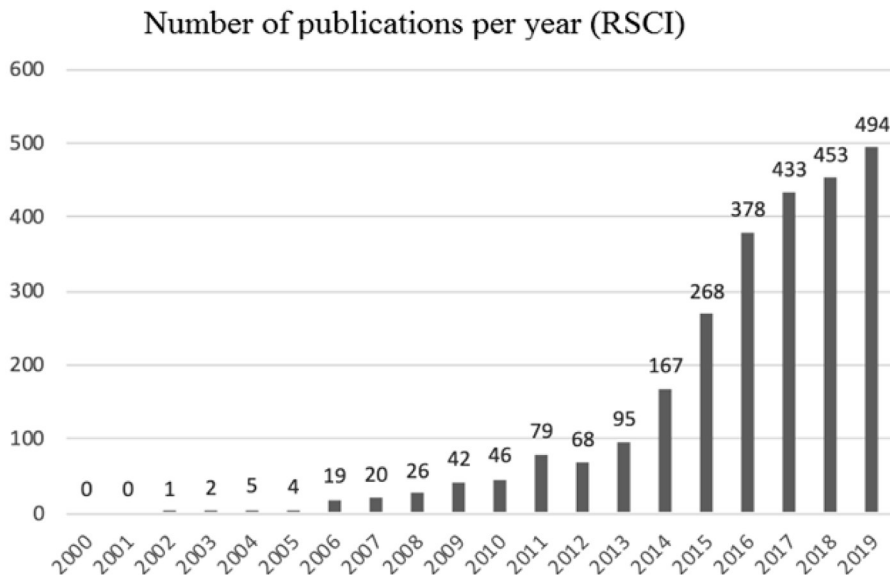
Fig. 2. Number of publications on the topic of ZPD in 2000—2019, Russian Science Citation Index (RSCI)

a ZPD. Instead, ZPD tends to be described mainly from the perspective of the student's development, rather than the teacher's actions. Thus, developing a model of teacher activity aimed at creating the ZPD is a key task that largely determines the successful implementation of the idea of development in school education.

Zone of Proximal Development: concept description

The ZPD concept can be considered in terms of "... the distance between the actual level of development as determined by independent problem solving and the level of potential development as determined through problem-solving under adult guidance, or in collaboration with more capable peers" [3]. ZPD was first introduced in the works of Lev Vygotsky at a relatively late period from 1932 to 1934. Various definitions of the

concept given in a series of lectures during this period in Moscow and in Leningrad, as well as in several major works published during his lifetime and later included in other publications [5], do not always coincide with each other. This is partly due to the fact that Vygotsky's scientific thought never stood still, but rapidly developed in accordance with his own understanding of the equivalence between a scientific concept and the meaning of a word. Here, his most important thesis was that, at the initial moment formation of meaning, the process has not terminated, but, on the contrary, has just begun. On the other hand, this issue is also associated with the process of involving a new concept in an increasingly complicated list of contexts and processes studied by Vygotsky, inevitably leading to the incorporation of the ZPD concept into a more general system of concepts in cultural-historical psychology. As a result, the meaning of the ZPD concept changes depending on its place in this system of concepts and in the description of various

processes and objects studied within the framework of the emerging cultural-historical theory.

If, instead of focusing on the chronological line of development of scientific research that led Vygotsky to formulate the ZPD concept, we trace the logical sequence of the development of his scientific ideas, the appearance of the concept of the ZPD can be simplistically represented as a result of studying the following interrelated set of research subjects and related inferences.

1). Theoretical study of the processes of development and transition from already established, matured psychological functions to those that are in the process of being formed and therefore are not observable in the present, but may become observable in the near future.

2). Locating the functional development mechanism in the cooperation of a child with an adult and in processes of imitation.

3). Experimental study of processes of meaning formation and the development of understanding, which support the possibility of cooperation with an adult and the further development of a child in the directions proposed by an adult, while the speed of this development is determined by the individual possibilities of meaningful imitation.

4). Diagnostics of different levels of possible cooperation with adults as different opportunities for meaningful imitation, and, consequently, different levels of development of still-emerging and developing functions along with the determination of the development potential of different individual students. The task here is not to diagnose what is already the result of previous development processes, but rather to analyse what is just emerging (the future stage of development, which most of the traditional tests "do not grasp"), and what can be influenced in the learning process.

5). Study of the relationship between everyday and scientific concepts as a projection of the problem of the development of meanings in the course of cooperation with an adult and the particular case of a more general relationship between development and learning.

6). The study of the ZPD from the point of view of what can be influenced in the transition from a laboratory and experimental situation to the practice of schooling rather than in terms of the phenomenology of developmental processes and analysis of those processes that determine its regularities.

It was here that Vygotsky the theoretician, who considered development from the point of view of a general methodology and analysis of the development of psychological systems — and (later) an experimental researcher who studied the process of forming concepts and meanings (the Vygotsky-Sakharov method of double stimulation) — was replaced by Vygotsky the practicing researcher trying to understand not only how it works, but also how it could be organised within the framework of Learning as a social institution (the study of complex processes of interrelation between previously-formed everyday concepts and scientific concepts formed in the course of organised school education). This also includes the study of the role of play as an activity aimed at developing the most important components of a child's psychological functions, including those necessary for his or her next stage of development and learning.

In the context of the present work, it is this part of Vygotsky's works expressing his ideas about the relationship between everyday and scientific concepts that are of maximum interest to us in the context of understanding the role of the teacher and the specifics of his or her activities in the process of organising education on the basis of the ZPD concept. It should also be noted that, although this particular part of Vygotsky's work did not attract much interest among researchers associated with Cultural Historical Activity Theory (CHAT), its remarkable popularity among practicing teachers led to a rather somewhat simplified consideration of how the concept of the ZPD can be understood and made to "work" in education practice.

The various explanations of the concept of the ZPD addressed to teachers basically boil down to a simplified view of the ZPD as a special type of assistance provided by a teacher to a pupil to help solve tasks that the child cannot solve on his or her own. Such recommendations often take the form of video materials made available on the Internet (Table 1).

Most of these videos end with a positive and encouraging statement that the organisation of this type of assistance (the specific content and organisation of which, as a rule, are not disclosed) promises success in teaching, understood as gains on the part of students in terms of the ability to solve similar problems on their own in the next step of their learning. In fact, such an application of ZPD with direct references to Vygotsky and cultural-historical theory comes down to the need to provide timely assistance to a child facing difficulties in solving tasks on his or her own. Even given the apparent triviality of this statement and the intuitive agreement of most

Table 1

**Examples of videos on the concept of the zone of proximal development
(according to YouTube, data as on June 22, 2020)**

No.	Title of the video	Views	Link (URL)
1	**2**	**3**	**4**
1	Vygotsky's Zone of Proximal Development	337 000	https://www.youtube.com/watch?v=0BX2ynEqLL4
2	Vygotsky's Theory of Cognitive Development — ZPD, Scaffolding, MKO │ (Psychology Theories)	385 967	https://youtu.be/MluvBAtv8oo
3	Zone of Proximal Development	141 850	https://youtu.be/7Im_GrCgrVA
4	Zone of Proximal Development	104 729	https://youtu.be/rX8lRh1u5iE
5	Zone of Proximal Development	84 000	https://youtu.be/Du6vqSOj7UU

of the teachers with this thesis, it is supported by scientific justification in the form of the ZPD concept, in fact, transforming the latter from a deep and complex scientific concept into an Internet meme.

Scaffolding: a way of constructing the ZPD or an independent concept outside of cultural-historical psychology?

The professional activities of a teacher aimed at assisting students in the process of solving learning problems have been repeatedly exposed to scientific scrutiny.

One of the best-known empirical studies of problem-solving processes engaged in by students in the context of guidance from a more experienced partner (i.e. another student) or adult was carried out by Jerome Bruner and his colleagues in 1976 [28]. This resulted in the concept of *scaffolding* (literally a temporary structure erected to help with the building or modification of another structure), denoting a special type of support given by a teacher to a student when performing a task that the latter might otherwise not be able to accomplish.

According to Bruner, such tasks, whose major attributes are specific to human activity and communication, are engaged in almost from the moment a child is born. This applies both when problems are solved during the learning process and through special actions undertaken by adults or more skillful peers to help the child in solving such problems. Bruner et al. argue that such actions do not occur, for example, in primates, where, although young individuals can observe the demonstration of certain behaviors, they are not involved in collaboration under guidance in solving the problems that are initially beyond their capabilities.

Bruner et al. argue that a child's capability to solve a problem with the help of an adult that could not be solved unaided emerges due to two important circumstances. Firstly, this occurs due to the adult's "controlling" of those elements of the task that are initially beyond the learner's capability, thus allowing him or her to concentrate upon and complete only those elements that are within his or her range of competence. As a result, the child may later develop an independent problem-solving capacity to an extent that greatly exceeds the previous capability. Secondly, the condition for this possibility is the need to comprehend the solution method, which may precede the very implementation of such a method. In other words, the child must come to an understanding of how the problem can be solved before the conditions for the implementation of the sequence of actions leading to its solution appear.

The process of comprehending the correct decision by comparing the means and the necessary results enables a child to distinguish good problem-solving strategies from bad ones under circumstances in which the child cannot develop his or her own good strategy. According to Bruner, the ability to "recognize or comprehend" a solution prior to its independent implementation relies on the child's orienting and experimental activities, in the process of which he or she tries to find the connection between the present conditions and the required result and build his or her understanding of the way to solve the problem. This searching process, according to Bruner, may require the support of an adult as an "activator" of the child's cognitive activity, who, depending on the specific conditions of collaboration with the child, implements one of the following functions.

1. Recruitment (gaining and maintaining the child's interest in the task).

2. Reduction in degrees of freedom (DOF)[1], i.e., a decrease in the complexity of the task to a level at which the child can act independently.

3. Maintenance of direction (keeping the goal of solving the task).

4. Marking critical features, including differences between the intended and achieved result of the child's action (in fact, this is one of the most significant functions associated with setting the conditions for the child to reflect on his or her actions).

5. Control of the child's level of frustration in the process of solving a problem, which comprises an important aspect not only in terms of cognitive guidance of a child, but also as motivational-affective measurement of cooperation with him.

6. Demonstration or modelling, which is considered not as showing a ready-to-use model of solving a problem by an adult, but rather as a means of idealising and highlighting a general way of solving: this can also include idealising (objectifying) the action approach (attempts at solving a task) carried out by the child him- or herself. Along with the marking of the critical features of a task, modelling creates the necessary conditions for the child to realise that his or her mode of action is different from the required one, thus facilitating the development of the child's independent action.

Having gained significant popularity since its introduction by Bruner et al. in 1976 (Fig. 3), the scaffolding concept came to be perceived as a particular way of constructing the ZPD. This perception was not inhibited by the omission of such a connection in Bruner's work, whose bibliography did not mention any of Vygotsky's works. However, following its appearance in the work of Courtney Cazden (1979) [9], the apparent connection between these concepts was explored in the work of an increasingly significant number of researchers [20].

Over time, the use of the term "scaffolding" in various contexts has become so profuse that, according to a number of researchers, it started being used synonymously with any kind of support provided to a student in the learning process [16]. As a consequence, its applicability in educational research has become very controversial [15]. One attempt to systematise the results of studies on the concept of scaffolding is presented in the work of Janneke van de Pol [25]. This systematic review cov-

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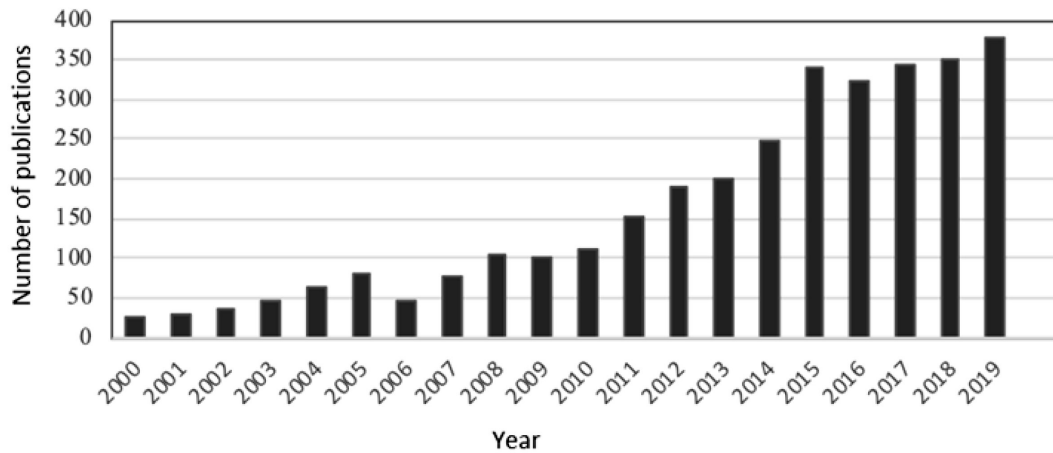[1] Concept developed by Nikolai Bernstein

Fig. 3. Number of publications on scaffolding in 2000—2020, Education, Educational Research and Psychology sections, Web of Science CC

ers 66 articles published in indexed databases between 1998 and 2009, including 8 studies aimed at evaluating the effectiveness of learning through scaffolding. The authors of the scrutinised articles argue that, despite the fact that no consensus exists with respect to the definition and understanding of scaffolding in the professional community, some clearly common characteristics shared by most researchers can be distinguished.

The first general characteristic of scaffolding can be referred to in terms of "limited or *adjusted support*", usually understood as providing the students with teaching support to the extent necessary for them to successfully solve a learning problem in cooperation with the teacher. Here, the teacher's support should either be at the same or a slightly higher level as the current level of the student's performance. The different nature and scope of the assistance provided by teachers is based on diagnostic data and evaluation of school pupils' actions in the process of independent problem-solving. Such support is not just differentiated, but it seems to be adjusted to the student or built on top of his individual action. Since the differentiation of this type of assistance to different children is based on the results of diagnostics organised in the process of joint activity, many authors mention a direct and immediate connection between the concept of scaffolding and such concepts as *dynamic assessment* [10; 11; 15; 21], *formative assessment* [25] and online monitoring or *online diagnosis* [14].

The second shared characteristic relates to the essence of the "scaffold metaphor as a temporary structure erected to help with the building or modification of another structure", understood as the provision of adult support to the student, which in the process of joint solving of a learning task will fade to the point of complete withdrawal (just as the need for scaffolding disappears with the construction of a building).

The process of reducing the amount of teaching support required by the student and its gradual withdrawal or *fading* from the space of joint action with the student is strongly related to the third common characteristic of the scaffolding concept shared by most researchers, namely the transfer of responsibility for joint action

implementation and control over the problem solution from a teacher to a student.

Investigating the content of psychological processes unfolding within the framework of scaffolding, a number of authors analyse the processes of interiorisation of the provided support [20], development of mutual understanding or *intersubjectivity* [14, 16] and the formation of shared meaning [22].

According to Van de Pol [25, 2010], analysing the scaffolding concept provides the possibility to create three different classifications on its basis. One such classification, which is based on the description of various means and techniques of adult support provided to a student, comprises six main types: modelling, adjustment/calibrating of the required level of support, providing feedback, instructing (demonstrating), questioning and cognitive structuring (decomposition) of the problem being solved [23].

The second classification, based on the description of the teacher's functions in the framework of joint action with the student, is given in the original work of David Wood [28] (as described fully above) and includes: recruitment, reduction in "degrees of freedom" of the student's action, maintenance of direction, marking critical features, control of student frustration and, finally, demonstration of a model of the correct performance of the action.

Another classification of the teacher's actions in the process of guiding the student in the framework of joint actions through scaffolding was offered in the works of Joyce Many [12] and Elaine Silliman [17]. This classification is connected with the distinction between the means by which such guidance is provided and the goals or intentions that the teacher sets for him- or herself.

The integrative framework obtained through a combination of six types of means (techniques) and five types of goals (Table 2) can be an effective tool for analysing both the content of the teaching guidance provided to the student within their joint action, as well as the direction of such guidance.

Any combination of scaffolding means with scaffolding intentions can be construed as a scaffolding strategy

T a b l e 2

Analysis of scaffolding strategies (Van de Pol et al, 2010)

Scaffolding goals				
Support for metacognitive performance of students	Support for cognitive activity of students		Support for student affect	
A. Directions of support	B. Cognitive structuring	C. Reduction in degrees of freedom	D. Recruitment	E. Contingency Management / Frustration Control
Means				
Feeding back	Giving hints	Instructing	Explaining	Modelling	Questioning

as long as three general conditions for this type of support are met (limitation, gradual reduction and transfer of responsibility). Although most researchers focused on describing and theorising scaffolding, some of them studied the effectiveness as well. In general, they all showed positive results. Further studies aimed at assessing the effectiveness of scaffolding should be associated with solving a number of difficulties arising in this case [25].

The first and possibly most important problem is that the three key characteristics of this type of cooperative assistance cannot be completely separated from one another. The teaching support, adjusted and adapted to the current level of the student's performance and action limits, decreases and "fades away" as the student's individual actions expand, leading to a gradual transfer of responsibility and control over the implementation of joint action from the teacher to the student. Thus, one feature actually "flows" into the second, and the second into the third. In this regard, it is the first feature that turns out to be the most important due to its role in causing the further chain of joint action transformations to arise [25].

The second problem lies in the attempt to assess the effectiveness of this type of teaching action. To account for these, the need to take into account not only the characteristics of the student's actions and personality, but also his or her behaviour patterns when interacting with the teacher and type of communication, significantly complicates the choice of proper assessment tools.

An additional difficulty that arises with such an assessment approach consists in the need to take into account and describe in detail the context of teacher-student interaction. This can also exert a significant impact on the effectiveness of the teacher's actions in the enactment of scaffolding strategies [25].

Criticism of the scaffolding technique

At the same time as the scaffolding concept was gaining in popularity, the number of researchers criticising the use of this metaphor in general — and its correlation with the concept of the ZPD in particular — grew. Much of this specific criticism revolved around two main positions:

• although scaffolding is used to represent the implementation of ZPD in training practice, it is understood too narrowly and fails to fully take into account the rich meaning of the ZPD concept;

• scaffolding is not directly related to ZPD, since the former is about Learning, while the latter is about Learning and Development.

According to Irina Verenikina, the reason why the scaffolding metaphor became so widespread among both researchers and teachers is due to its close relationship with the latters' intuitive ideas of what effective learning is, i.e. understood as providing structured support to children in the process of solving training tasks. At the same time, the metaphor appeared to be too broad, becoming, in essence, an umbrella term for the provision of teachers with clear and explicit instructions that help them to ensure the practical development of students in their learning process [26].

Moreover, due to its consideration outside the context of cultural-historical theory, the concept of scaffolding is generally considered as a teacher-initiated, directive instructional strategy, which conflicts with the initial understanding of teaching as *inter*-action of the teacher and students to build new knowledge together. Some enquirers even consider this concept as a regression to an era prior to Piaget, whose research revealed the very significant role of the activity of the child him- or herself in the process of shaping his or her own development [20].

Thus, scaffolding is often criticised as being an excessively narrow way of operationalising the concept of the ZPD due to its focus on the disadvantages of dominant teacher actions, whereas Vygotsky's focus remained on the joint actions of children and adults. This leads some researchers to the conclusion that, despite some correlation, the scaffolding metaphor fails to capture the essence of Vygotsky's ZPD concept, inappropriately representing the interactions of two actors as a one-sided influence on the part of the teacher ("a street with one-way traffic").

According to Verenikina [26], such a view may be explained in terms of Vygotsky's cultural-historical theory having appeared in a wide professional discourse after an earlier popular representation of a child as an active builder of his/her own development carried out in the course of numerous discoveries in the process of his interaction with the environment. This cognitive or individual constructivist point of view associated with the works of Piaget that appeared before the works of Vygotsky, whose emphasis is placed on the role of social interactions mediated by signs (social constructivism), formed a stable attitude on the part of most researchers that the source of a child's development consists, first of all, in his or her active interaction with the environment. In this context, any interaction with an adult — especially with a teacher, who is a truly active participant in their joint action (and not only the authors of the term of

scaffolding think so, but also Vygotsky himself) — can be considered as a limitation of the child's activity, immediately coming into conflict with the previously formed views of the researcher in line with Piaget's theory. Nevertheless, in the opinion of the present author, this does not necessarily contradict the position of cultural-historical theory.

From this point of view, the criticism of the concept of scaffolding appears to be curious because it illustrates the fact that previously formed spontaneous notions do not disappear completely within the framework of children's development from the beginning of concept formation in the course of the organised learning; moreover, even the researchers' previously formed notions of the processes of the development of these concepts in children do not disappear, entering into complex relations with the new ideas, whose balance never exactly coincides with the authors' understanding of these new ideas. It would seem that the more urgent this problem of synthesis of old and new scientific concepts is, the less defined and more metaphorical these new ideas become, as seen in the case of the concepts of the ZPD and scaffolding.

An attempt to reveal the content of a metaphorical object (ZPD) through a metaphorical description of actions in it (scaffolding) should initially lead to a significant level of uncertainty and a wide variety of interpretations up to incredible simplifications and inversions in understanding the key ideas that the authors of the terms put on in the form of the metaphors under consideration.

Peter Smagorinsky articulated another strong position regarding the concept of scaffolding as having no direct relation to the concept of the ZPD [18]. In Smagorinsky's opinion, one of the reasons for the prevalence of the extremely simplified understanding of the concept of the ZPD by teachers and its identification with the scaffolding method is the aim of individual teachers and schools to obtain rapid positive results under the conditions of ongoing internal and external accountability evaluations. Many researchers have a literal rather than metaphorical, understanding of the ZPD, according to which a student will be able to act effectively and independently *tomorrow*, if he or she is provided with properly organised support today.

Expanding on Smagorinsky's critical ideas, we note that one of the most important differences between the ZPD and scaffolding concepts is that the dimensions (primarily, the *time* dimension) of these concepts turn out to be completely different. The duration of interaction and existence of scaffolding as a specific (albeit very complex in structure, form and purpose) adult support to a pupil in the process of solving a learning task is limited by the duration of its solution. Thus, the *time* characteristics of the ZPD are by no means determined or limited by the parameters of time spent on a joint solution of a specific task with an adult or even a whole series of such tasks. Rather, the time span of ZPD is determined exclusively by the speed of development processes and those social interactions that pave cultural or "artificial" ways for this development, mediating them with various sign-symbolic means that transform both the content and directions of infant thought development. To sum up this

remark, we can conclude that the time characteristics of scaffolding appear to be much shorter, being determined by the time of solving the task with adult support. In other words, since the period of ZPD existence is determined by the rate of maturation of the child's capabilities and the level of influence of the adult and culture on this process, it is a significantly longer process. From this point of view, we can say that a direct comparison of scaffolding and ZPD looks incorrect to a certain extent, since in one case we are comparing problem-solving performance with the help of an adult, and in the other, a complex process of the development of psychological functions under conditions of social interactions mediated by signs.

Following Luis Moll, Smagorinsky points to another essential feature that is often overlooked in the process of elaborating the ZPD concept through such a literal understanding of the "tomorrow" metaphor, comprising the role of social context in the construction of a ZPD [19]. From his study of aspects of educational processes of migrant children, Moll came to the conclusion that their previous social and cultural experience (largely different from that in the United States) played a significant role in interacting with their teachers [13]. This conclusion, which correlates with the concept of cultural means, directly coincides with a much deeper understanding of what is mastered by pupils in the framework interactions with teachers. The result of mastering, obtaining and comprehending such means largely depends on the social context, including the past experience of students. According to Smagorinsky, the child's past — especially social and cultural — experience has a significant influence on the process of generalisations. As a matter of fact, while the research carried out by Vygotsky and his colleagues emphasised understanding of the past, as previously-formed everyday concepts, the formation of which took place in a different social context outside the organised learning, Smagorinsky and Moll mainly focus on previous cultural context and experience, which has the experience of another social or ethnic group affiliation, rather than individual childhood experience. To summarise the position of many of the researchers [27] described above, we shall note that the scaffolding method, being a fairly effective method for solving a number of professional challenges and involving the teacher's structured and limited support to students in the process of solving learning tasks, does not have a direct relation to the ZPD concept or its implementation in professional practice. Neither the way of organising the students' learning activities in accordance with the notion of ZPD, the processes of interaction between the teacher and students, nor the chronotope of such interaction (its correlation with the time dimension), coincide with the way it is described through the scaffolding method.

In Russia, the concept of scaffolding, never the subject of much enthusiasm among researchers and educators, played an insignificant role in bringing together the concepts of learning and development. However, if we look at another example of the development and propagation of the concept of "developmental education", which is close in meaning, we can see an almost identical mechanism of transforming an ac-

tual pedagogical practice into a formal-developmental, but, in fact, still a traditional one. As in the case with the concept of scaffolding, a large number of teachers, who had become acquainted with Elkonin and Davydov's ideas of developmental education, but who had not entirely mastered the in-depth essence of this approach, shortly after argued that they themselves used the elements of developmental education. However, behind this mechanism is a lack of a clear description of professional activities aimed at the development of students (irrespective of whether it is the construction of the ZPD of an individual or the development of the whole class within a specific program of subject teaching), as well as the formal nature of the professional generalisation itself, carried out by the teacher in the course of mastering new professional practices. Typically, it is only the external characteristics of the new approach to professional actions that are "captured" by the professional concepts formed within this process and recorded using the same term used by the developers in scientific literature. Due to the content of this notion being subject to dramatic transformation and simplification, it is often transformed into something opposite to its original meaning.

The same idea is stated in Smagorinsky's paper, in which the training of future teachers is analysed. [19]. The author's most important conclusion is that the traditional model of teacher education is disadvantaged by too little emphasis on theory rather than practice which is usually stressed. This means that, while the graduates of such programs master necessary professional knowledge, it is not at the level of concepts, but, at best, at the level of complexes similar to those levels of the development of children's ideas proposed by Vygotsky.

On the other hand, the way in which most teachers are introduced to the new content of the concept practically excludes any type of generalisation and understanding of new professional notions other than formal. The reason why teachers generally master new content at the level of complexes and pseudo-concepts rather than at the level of concepts is because the conceptual approach to mastering a new professional generalisation requires an activity-based means of transferring it. In most cases, the fact that traditional pedagogical professional development models do not meet these requirements usually results in the formation of professional thinking in terms of complexes along with a significant simplification of the content being mastered.

In this regard, many researchers have good grounds for emphasising the need for clearer pedagogical recommendations and specifically organised activities aimed at mastering scaffolding [25].

Thus, despite the fact that a significant number of teachers oversimplify it, the concept of scaffolding represents a real step forward in an attempt to construct a pedagogy of development [20]. In a sense, it has already fulfilled its mission and become a model of the unit of a teacher's activity, which is aimed at the development of a student's independent action by providing him or her with the necessary support adjusted to the individual level of performance, rather than at the direct transfer of information to students to make them memorise and reproduce it.

Further efforts to clarify and saturate this method of pedagogical work with the deeper scientific content originally formulated by Bruner and his colleagues — or its more accurate positioning in the system of the concepts of the cultural-historical theory — will make it possible to move from simplified versions of such teacher actions to more complex and appropriate tasks aimed at students' cognitive development. In fact, if we continue a series of metaphorical remarks on this topic, we can say that the main credit for the emergence and dissemination of the concept of scaffolding is that it turned out to be a "Trojan horse", by which means the idea of development (and, consequently, the ZPD) was able to penetrate into the "fortress of traditional education", changing the very essence and direction of pedagogical action.

Back to Vygotsky: ZPD as the development of spontaneous (everyday) concepts

As noted above, the problem of a simplified interpretation of the ZPD as adult support to pupils in solving tasks is partially related the definitions of this concept being significantly different in Vygotsky's works. One of these is his famous statement that "what a child can do in cooperation with an adult today, he can do alone *tomorrow*". In this connection, it becomes important to understand how Vygotsky defined the ZPD in his later recent works that had implicitly absorbed the history of previous inquiries.

In the context of understanding the specifics of the teacher's actions aimed at building the ZPD, we believe that the most promising works of Vygotsky on the correlation between everyday and scientific concepts are, in particular, his preface to the work of Josefina Shif "On the Study of Scientific Concepts in Schoolchildren", as well as this study itself, carried out under the leadership of Vygotsky, and "Development of Everyday and Scientific Concepts at School Age", which is a transcript of a lecture given by Vygotsky at the Leningrad Pedological Institute in 1933.

Discussing the problem of the formation of scientific concepts in the course of school education in terms of their relationship with everyday concepts that arise before and outside school, Vygotsky comes to a number of important conclusions formulated below.

1. The development of scientific concepts cannot be based other than on the development of spontaneous concepts. Since the border between them is fluid, they flow into each other repeatedly.

2. At the moment of mastering a new word, the development of the meaning, generalisation or concept fixed in it does not terminate but, rather, it is only getting started.

3. Piaget considered the correlation between spontaneous concepts — that is, the products of the child's own thought — and of scientific concepts as antagonistic. The former are replaced by the latter in the process of developing socialisation at whose apex is learning. The teacher must consider spontaneous concepts as his or her enemies in order to suppress and destroy them. On the contrary, according to Vygotsky, it is impossible to imagine the

formation of scientific concepts outside of spontaneous concepts rather than on their basis. Scientific concepts do not flow through different channels, but developing through interaction and change. The development of scientific concepts is a process, rather than a one-time action. It is constructed on the basis of everyday (spontaneous) concepts, which become increasingly generalised and conscious in the course of organised learning. Scientific concepts cannot be memorised; rather, the child's thought must rise to this level of generalisation [4].

From this point of view, it is legitimate to argue that in the process of interaction between a teacher and a student, which is constructed as a ZPD, the teacher must create conditions for the development of spontaneous concepts of the student. In this case, the ZPD can be seen as a space (or unit of learning) in which, in the process of specifically organised student-teacher interaction (or interaction between students organised by the teacher), the development of spontaneous concepts and their transformation into scientific concepts can be ensured.

By forming a scientific concept, education paves the way for increasing the level and degree of generalisation of spontaneous concepts as a unit of the child's own thinking. At the same time, the ZPD shows a prognosis and the ability to transform spontaneous concepts in the learning process. The formation of scientific concepts becomes a means of increasing the consciousness and generalisation of spontaneous concepts as units of the child's everyday thinking.

A person thinks with reference to spontaneous concepts that are limited in the degree of generalisation and their awareness. Education, forming scientific concepts as methods of higher generalisation based on the course content, creates conditions for thereby increasing the quality of spontaneous (everyday) concepts that a child may use outside the course. Vygotsky repeatedly emphasised that the child's thinking is a unified and holistic process. By creating more perfect means and units of thinking in the process of organised learning, these means (scientific concepts and the methods of generalisation associated with them) transform all the others (everyday concepts), increasing the level of their generalisation and awareness (which, in fact, was exposed to Shif's scientific scrutiny).

In this context, the formed scientific concepts themselves become the ZPD for the development of spontaneous concepts, i.e., children's thinking. The degree of formation of scientific concepts can be a tool for assessing the further transformations of spontaneous concepts. Learning through the formation of scientific concepts and their influence on spontaneous concepts is the most important "mechanism" for the development of holistic processes of schoolchildren's thinking.

The idea that the formation of scientific concepts does not lead to the destruction or disappearance of learners' spontaneous concepts, but, rather, to their reorganisation, is related to the more general theoretical position of Vygotsky on the reorganisation of some psychological functions and the formation of new psychological systems, whereby previously independent psychological functions do not only develop themselves, being mediated by sign means, but also form new associations of these functions. For example, thinking and speech start from a certain moment, forming verbal thinking, which leads to a qualitative change in each of them.

The above position of Vygotsky can also be applied to the problem of the content of school education. In terms of the development of this position, children study at school not only in order to embrace a certain set of knowledge, most of which will never be useful to them and much of which will become outdated by the time they finish their education. Rather, the purpose of school education consists, first of all, in the formation of scientific concepts based on the material of school subjects, ensuring the development of the child's entire thinking (including his or her everyday concepts). If the achievement of this goal can be combined with the acquisition of the knowledge that will be needed in life, then this turns out to be doubly useful. However, if the process of mastering this knowledge itself does not cause the motivation to acquire it, but, on the contrary, is accompanied by a crisis of interest, then the above "mechanism" of education simply does not work. On the other hand, if the learning does not result in scientific concepts of a high level of generalisation and arbitrariness in their use (awareness), then the mechanism of the "educational transformer of spontaneous thinking" also does not work, since the necessary means which, like a locomotive, begin to "drag" spontaneous concepts to a higher level, are not created. Learning which fails to form scientific concepts does not become the ZPD of thinking. Thus, the concept of the ZPD cannot be reduced to the question of organising a teacher's assistance to a child in the process of solving tasks. This position is an extreme oversimplification, resulting in the very essence of the concept of the ZPD being misunderstood. As consistent with Vygotsky's initial position, ZPD is a mechanism for the influence of learning on a child's development through the formation of high and arbitrary generalisations and the restructuring with their help of all other units of thinking (spontaneous concepts) formed on the basis of material outside the educational substance.

The mechanism of how learning leads development is associated with scientific concepts formed in the course of organised learning rebuilding the whole process of the child's holistic thinking (including his spontaneous concepts), making them more generalised and conscious.

The power of spontaneous concepts lies in the fact that they have personal meanings, they are emotionally coloured, being the results of generalisation of the child's own sensory or objective experience.

At the same time, most of the scientific concepts related exclusively to verbal definition do not possess such sensory experience, vivid impression and personal meaning, which creates, according to Vygotsky, the risk of formalism in the process of their assimilation only through memorisation, and not through the development of thinking as actually occurs in most cases within the framework of "traditional" education.

In their genesis, spontaneous concepts are generally products of a child's dynamic independent activity (although, as a rule, they are mediated by interaction with a collective adult), while scientific concepts are the result of the direct interaction between student and the teacher.

Most of the definitions of the ZPD relate to the character of the interaction between a teacher and a student in the course of learning — that is, the forms of this kind of cooperation and the processes associated with it: imitation, communication, mutual understanding.

At the same time, the approach to the ZPD concept proposed here following Vygotsky and Shif refers primarily to the content of interaction between a child and an adult, consisting in the cooperative creation of a scientific concept. The development is carried out as a mechanism for the influence of more generalised and conscious scientific concepts on those that spontaneous arise affecting a learner's entire cognitive holistic process.

In this case, the development of the child's thinking turns out to be associated, first of all, with the process of changing concepts (*conceptual change*) and cannot be reduced to a teacher's assistance in the process of his or her interaction with a student. "... what has been achieved in the development of a scientific concept acts as the Zone of proximal development for an everyday (concept)" [8, p. 79].

The ZPD concept, presented by Vygotsky and Shif in the context of the correlation between scientific and everyday notions, actually defines scientific concepts as the zone of proximal development of everyday concepts and the child's thinking as a whole.

However, if we examine in detail the very mechanism of the development described by Vygotsky in this connection, then it implies at least two different processes.

1. Formation of scientific concepts as a tool for generalisation and development of everyday concepts.

2. The process of generalisation and understanding of everyday concepts, which to a certain extent occurs automatically due to the integrity of the thinking process. If someone has formed scientific concepts on some subject area, then they will inevitably (and spontaneously, that is, without additional efforts) begin to rebuild other areas of thinking and everyday concepts in them.

Let's leave aside the fact that the first statement has been proven (which is a continuation of the theory of formal discipline by Johann Friedrich Herbart and the transfer of the achieved effect to other areas), both from a theoretical and an empirical point of view.

Consideration of the second part of the ZPD mechanism, namely the generalisation and understanding of everyday concepts, allows us to consider it as the main content of such an interpretation of the concept of the ZPD.

In this case, a natural question arises: is the formation of a scientific concept the only way to develop everyday ideas and is there a direct means to stimulate their development, not mediated by the formation of scientific concepts, but involving other mechanisms and processes?

In our opinion, such a method consists, for example, in a collectively-distributed form of organising joint solution of tasks, in which a given form of distribution of individual operations or elements of a task in the course of joint action forces its participants to cooperate, to argue their mode of action — and, ultimately, to awareness, reflection and development.

Another example of a psychological process of exteriorisation of spontaneous concepts, dialogue and the construction of a more complete and conscious concept with its subsequent interiorisation is seen in the program "Philosophy for Children", which directly uses the method of Socratic debate and group discussion as a mechanism for the development of the initial concepts of students on the basis of philosophical issues.

According to Vygotsky, the role of interiorisation processes prevails (which fully corresponds to his more general methodological position on the role of the social in the formation of the psychological); however, from our point of view, no less important is the role of exteriorisation processes, without which the objectification of spontaneous concepts, i.e. their awareness and change, turns out to be impossible.

In fact, it can be assumed that the pedagogical actions of an adult in building the ZPD are largely reduced to creating conditions for the exteriorisation of spontaneous concepts, their awareness and the development of more general and more conscious concepts adequate to the object under study. The specific forms of implementation of such actions of the teacher can be very different: from the organisation of collectively distributed actions of students to jointly solve tasks to Socratic debate in the lessons of "Philosophy for Children" or in the course of specially organised dialogues based on the educational materials of academic subjects.

From the point of view of the goals of which Vygotsky speaks, it is the method of development of everyday concepts — which is actually central to the position of Vygotsky himself and associated with the formation of scientific concepts as a tool for restructuring everyday concepts and thinking in general — that seems the most problematic.

Firstly, Vygotsky himself sees significant risks in the fact that no training is able to cope with this task, but only that one which really ensures the formation of scientific concepts, an example of which can be seen in the system of developing education. However, as can be seen from the implementation of this system, there is still sufficient experimental lack of evidence of significant transfer and long-term effects outside of educational substance, including empirical data on the restructuring of everyday concepts under the influence of formed scientific concepts. In addition, from a theoretical point of view, it seems that neither Davydov's concept of learning activity nor the more richly diverse practice of developmental education, could convincingly answer a number of important theoretical questions concerning the students' spontaneous concepts and teacher's actions in this context. In comparison with the formation of dialogical concepts (criticism of the concept of learning activity from the standpoint of the scientific School of the Dialogue of Cultures), the role of scientific theoretical concepts as catalysts for changing the quality of the student's holistic thinking also remains not fully understood [1; 2; 6].

Conclusion

If the teaching is aimed only at mastering formal knowledge rather than at the development of students' spontaneous concepts, then neither the acquisition of knowledge, nor the development of students, is fulfilled.

For students who are carriers of their own spontaneous concepts, the acquisition of knowledge as the main goal of school education is impossible without transformations of these concepts. Otherwise, new formal knowledge can only be memorised, but cannot be applied in practice, while the initial spontaneous concepts of children's thinking will remain in their original form and determine the way students act. It follows that the main goal of any formally organised schooling is not any mere mastering of this knowledge, but one that is simultaneously accompanied by the transformation and development of the initial concepts of students.

The formation of a new type of students' thinking occurs, in our opinion, in a fundamentally different way from how it is described in the classical version of the theory of learning activity in the process of forming scientific concepts. In accordance with the initial position of Vygotsky, it is not scientific concepts that are formed, but their synthesis with initial concepts as a fundamentally different, two-sided process not only from top to bottom, but also from bottom to top by comprehending and generalising initial concepts along with their rise and connection with scientific concepts. The point where they meet in the form of a "real", or actually-formed concept, will always be an individually specific centaur of a scientific-spontaneous concept, in which the balance of parts is unique and determined by individual characteristics. At the same time, the student does not form any "pure" theoretical concepts (which we can find in science but not in personal competence); they are always mixed in a certain proportion with conscious and generalised initial spontaneous concepts. The greater the level of abstraction available to the child, the less spontaneous initial concepts remained in them.

The role of the processes of exteriorisation of initial concepts, i.e. their objectification, reflection and transformation into an object of targeted changes as a result of the organisation of collectively distributed individual actions or a specifically organised educational dialogue, is a key mechanism for the development of initial concepts to the level of scientific concepts. At the same time, this activity forms the main content of a teacher's professional actions in building students' zones of proximal development.

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Зона ближайшего развития, скаффолдинг и деятельность учителя

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В статье рассматривается понятие зоны ближайшего развития (ЗБР) с точки зрения возможностей его реализации в деятельности педагогов. Дан сопоставительный анализ понятия «скаффолдинг» (scaffolding), введенного Д. Брунером; показано сходство и отличие этого понятия от ЗБР. В контексте возможной операционализации в педагогической деятельности автор рассматривает описанное Л.С. Выготским сложное взаимодействие спонтанных (житейских) понятий, сформированных до начала школьного обучения, и научных (теоретических) понятий, формируемых в ходе обучения в школе как ключевое содержание понятия ЗБР. Основная идея Л.С. Выготского о ведущей роли научных понятий в перестройке ранее сформированных спонтанных представлений и развитии всего целостного мышления ребенка позволяет сделать вывод о том, что наряду с этим возможен и непосредственный способ воздействия на спонтанные представления с помощью организации коллективно-распределенных форм учебной деятельности и метода сократического диалога. Ведущими психологическими процессами, обеспечивающими при этом развитие спонтанных представлений путем их большего обобщения и осознанности, являются процессы экстериоризации исходных представлений, рефлексии и последующей интериоризации коллективно построенного понятия. Деятельность педагога по построению ЗБР предполагает, таким образом, организацию условий для распределения индивидуальных операций в рамках совместного учебного действия или организацию полилога, обеспечивающих эффективное функционирование указанных психологических процессов в рамках специально организованной учебной деятельности учащихся.

Ключевые слова: зона ближайшего развития, скаффолдинг, культурно-историческая психология, Выготский Л.С., педагогическая деятельность.

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The "Ambivalence" of Joint Activity as the Basis of the Emergence of Psychological Neoformations: Ways of Developing the Activity Approach

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The article addresses the methodological status of the category of joint activity which, obviously, opens up new possibilities to consider the psychological mechanisms of a person's development. Special attention is paid to the content of the concepts "object of activity" and "subject of activity", which determine the comprehension of the main characteristics of activity as a process of instrumental transformation of the activity object into its subject, so that the latter embodies the mode of activity used for its creation. The key points of the activity approach by A.N. Leontiev are considered, especially those concerning the sources and conditions of activity development as well as its psychological mechanism which determines the inner dynamics of this contradictory process. These contradictions arise in the course of changes within the subject-tool and communication components of the joint activity, which act, respectively, as the leading forms of transformation of the subject reality and as the means of organizing the interaction of the persons involved into the shared performance of joint activity tasks solution. It is emphasized that the dual nature of activity as a whole including its subject-tool and communication components is fully expressed through a mode of activity, created by person. Contradictions arising in the subject-tool and in communicative component are resolved by their mutually conditioning transformations. This leads to a change in the motivational basis of the subject activity, which determines the development of the subject-tool component of the modes of activity, which, in turn, leads to the development of modes of communicative regulation of the system of relations.

Keywords: object and subject activity, communication, joint activity, mode of activity, modes of actions, development, system of relations, intercourse, motivation, contradictions of activity.

Introduction

The relationship between the subject activity (practical tool-equipped human activity) and sign-mediated communication is undoubtedly one of the most problematic issues within the methodological paradigm of the cultural-historical psychology. Since the works of Vygotsky its various aspects have been considered in a number of studies here [2; 10; 15; 36] and abroad [14; 40 et al.].

Some of my papers of the recent years also addressed that issue [31; 32; 43]. The key idea discussed in one of the mentioned papers [31] is that the relationship in question should be treated as based on a more general relationship between tool and sign, as it was initially formulated in the work of the same name by L.S. Vygotsky [5, vol. 6, pp. 5—90]. Moreover, in that paper an attempt was made to take another step and demonstrate that it is a different comprehension of the role of

tool and sign in the psychological development of the individual that is behind the discrepancy between the cultural-historical theory of L.S. Vygotsky and the instrumental psychology which he elaborated earlier, but which later became the basis for the development of the theory of activity by A.N. Leontiev — his closest collaborator.

It seems to be the point where the two scholars went separate ways. However, the paper also emphasized the possibility of the new coordination of L.S. Vygotsky and A.N. Leontiev's different positions — within the context of elaboration of the category of joint activity.

In this paper I'd like to highlight the possibilities of this category in exploring the specific unity of the tool-equipped activity and communication. To do this one has to come back to the way these concepts were developed within the frames of the Russian psychology.

1

While in the cultural-historical theory of L.S. Vygotsky priority was given to tracing the function of the sign in communication and in the development of consciousness [6] A.N. Leontiev sought to uncover the role of tool in changing the patterns, content and psychological mechanisms of human activity functioning and development [19]. Moreover, the sign itself was interpreted by him as a tool and, accordingly, speech communication was considered as a form of tool-mediated activity [20, p. 250]. «... The very idea that the higher psychic functions are mediated by tools, writes A.N. Leontiev, arose from the analysis and along the lines of the structure of mediated labor. The tool, transformed into a sign, retains the purposefulness of the process". In another work, which is a transcript of his speech on the history of L.S. Vygotsky' psychological school, he notes: "What is speech? It's communication, it is, roughly speaking, intercourse, one of the forms of intercourse — communication through meanings, signs. It's also indirect, it's also tool-mediated communication" (stressed by me — N.N.) [19, p. 111]. As you know, A.N. Leontiev continued to develop the theory of activity throughout his scientific work, but, unfortunately, his position gradually shifted to the study of motivational and semantic features of activity, which arise in the course of activity as a natural result of subjectifying the need and, according to A.N. Leontiev, turning its subject into a motive so that the person's attitude to this motive gives a particular personal meaning to the acts of activity.

The activity approach still remains one of the leading in Russian psychology. However, there is the problem of the subject matter of activity which requires some serious psychological analysis for its identification in each particular situation. Yet it has hardly been developed for many years although A.N. Leontiev himself viewed the subject matter of activity as its basic feature [18].

A.N. Leontiev himself noted: "I still use the system of concepts that I once proposed in relation to the analysis of activity and, of course, I would like to develop an attitude, first of all my own, to this system, to revise it again. It seems that this system needs to be developed — which in recent years has not been done in fact. This system of concepts turned out to be frozen, without any movement. ... The concept of activity is not developed in the highest degree" [20, p. 247].

Obviously, one of the reasons for the stagnation in the system of concepts that make up the content of the theory of activity developed by A.N. Leontiev is related to the interpretation of the category "subjectiveness of activity", which he considered basic in his conception.

Meanwhile, some problems arise that should be discussed in this relation. The first one is connected with the wording used for translation of A.N. Leontiev's statement cited here:[1]

"A basic or, as is sometimes said, a constituting characteristic of activity is its objectiveness. Properly, the concept of its object (Gegenständ) is already implicitly contained in the very concept of activity. The expression "objectless activity" is devoid of any meaning. Activity may seem objectless, but scientific investigation of activity necessarily requires discovering its object [14, p. 37].

Addressing A.N. Leontiev's reasoning I certainly agree with this idea of, since to analyze the psychological features of activity without fixing its "subjectiveness" means to make this analysis pointless [see 2].

But let's pay attention to the continuation of the quote:

"Thus, the object of activity is twofold: first, in its independent existence as subordinating to itself and transforming the activity of the subject; second, as an image of the object, as a product of psychological reflection of its properties that is realized as an activity of the subject and cannot exist otherwise [Ibid., p. 37].

Unfortunately, this variant of translation not only seems to provoke a certain misunderstanding of A.N. Leontiev's position because of its wording but, to a certain extent, strengthens another problem: a methodological error which, obviously, it contains and which will be discussed below. In order to finish with the wording problem it seems necessary to present another variant of the extract translation which in this context is, obviously, more correct:

"<...> the subject of activity is twofold: first, in its independent existence as subordinating to itself and transforming the activity of the subject (the one who acts, the actor); second, as an image of the subject matter, as a product of its properties psychological reflection that is realized as the product of the subject's activity and cannot exist otherwise" [17, p. 84].

Let us emphasize that A.N. Leontiev himself felt that the use of this term could create misunderstandings, that it is fraught with possible misinterpretation of his thoughts and he tried to eliminate it. Back in the 30s of the last century, developing the terminology of the activity approach, he wrote:

"This term — the subject of activity — however, also has its negative sides, thanks to which it can create misunderstandings. We will discuss one of these negative aspects in advance. It consists in the fact that, <...>, the term subject is ambiguous: in ordinary usage, it always means something positive and real. Here we use the term in its more general, philosophical meaning, (for example, relation as an object of thought; music as an object of

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[1] Since the article is addressed to English speaking readers it is necessary to emphasize that the English version of the statement [41, p. 37], quoted by us from the translation of the book by A.N. Leontiev "Activity. Consciousness. Personality", published in England in 1978, does not correspond to the meaning that A.N. Leontiev had in mind. The reason for this is Russian-English terminological discrepancy between the terms "object" and "subject". First, it concerns the use of the term "object" in the English translation instead of the term "subject", as in A.N. Leontiev's original version of the book. Besides, an adequate understanding of this extract by the English reader is complicated by the fact that there are two terms corresponding to the English term "subject" in the Russian language: in addition to the already mentioned "subject" as a product of activity, the term "subject" can also refer to someone who acts.

musical feeling, etc.); thus, speaking, for example, about the subject of the reading person's activity, we will mean, of course, not the book as a thing, but its comprehended content, etc." [20, pp. 94—95].

Paying tribute to A.N. Leontiev's thoroughness we should proceed to the analysis of content and that probably would help to clarify the terminology problem as well.

It is obvious that in his commentary by the subject of activity A.N. Leontiev does not understand an object as a fragment of objective reality that exists independently of the subject (the one who acts, the actor). To him the subject of activity is represented by some significant for him properties of the object, which appear to him as the result (product) of his activity.

And the example of a book, which A.N. Leontiev gives, only emphasizes this. The book that is already a product of the publishing industry, focused on the reader may, however, be subject of not only reader's activity, but also of other activities, for example, it can be used as a stand for kettle or material for kindling the fireplace in some peculiar situation, etc. Apparently that "comprehended content" of the book — as specified by A.N. Leontiev the subject of reader's activity and its legitimate product is not contained in the book itself. It occurs to the subject (the reader) as a result of his activity. It is created by the reader himself in the process of reading, when working with the text. i.e., it is the result of the reader's activity. If this reader turns out to be a literary critic, then this content will become the subject of his critical activity.

With this interpretation of the subject (as a product of activity), we can hardly agree with A.N. Leontiev that such a subject (product of activity) can exist primarily — "in its independent existence from any activity". It is the objective reality that exists independently of the subject of activity. So not the subjects of activity (its products) — as "subordinating and transforming the activity of the subject" (the actor) but objects — fragments of objective reality can exist independently of the subject (the actor). Any organism (including a person) can interact with an object and turn certain properties and characteristics of this object into the subject of its activity.

Even regardless of such an interaction any fragment of the objective reality theoretically can not be considered as a "subject matter", or as a certain "thing" — a synonym A.N. Leontiev sometimes used instead of the term "subject" in his texts [16, 18 et al.]. On the contrary, it should be considered as an object of theoretical analysis, i.e. as a universe of various and inexhaustible properties and characteristics which in the course of activity can become the subject of activity, because "... the electron is inexhaustible, just like the atom" (V.I. Lenin). However, even in this case, it is necessary to make a methodologically important clarification: it is the objective reality that must be considered inexhaustible, including the fragment of it that in our theoretical activity first appeared as an "atom" ("indivisible"), and then as an "electron".

Let us analyze a very typical example in this regard, which A.N. Leontiev gives in order to illustrate the relations between object and subject of activity in the first edition of "Problems of the development of mind" in 1959. "The essence of marble," wrote A.N. Leontiev, "is really exhausted by its manifold properties, which it reveals in its manifold interactions with other bodies. In relation to an elastic body, it reveals itself as a body that has elasticity, in relation to light rays — as a body that reflects light waves of certain frequencies, in relation to electricity — as a dielectric that has a certain dielectric constant, in relation to acid — as a set of molecules that disintegrate with the release of carbon dioxide, and so on. In the aggregate of these multi-sided manifestations the features of its internal structure reveal themselves as well as the laws of its inherent forms of interaction, in short, — demonstrate what it is" [16, p. 35].

It is obvious that A.N. Leontiev understands that "marble", which has become the subject of his theoretical analysis in the course of various ways of working with it as an object, reveals its different properties. But let us ask ourselves: to whom in the course of our action on this object called marble are these "multi-sided manifestations" inherent? Obviously, to marble, as A.N. Leontiev writes, or to an object that manifests or can manifest its properties in different ways in various possible effects on it that a person performs with it, including those that A.N. Leontiev uses. Unfortunately, A.N. Leontiev does not give an example, but they are quite at hand. For example, the situation when marble is used as a possible facing material or as a material for creating sculptures. It is obvious that all these manifestations belong to the object as a fragment of objective reality.

However, this object acts as marble only when it is used as a material for cladding, i.e. as a stone formed more than 40 million years ago from bottom, mainly limestone deposits and easily processed with certain tools, which made it a material that has important qualities for construction, including for the manufacture of art objects. It is appropriate to recall the phrase once uttered by Michelangelo Buonarroti, which was reproduced by many sculptors after him: "I see an angel in marble and work with a chisel until I release it."

As a dielectric or a body that has elasticity, a variety of objects can act, and not only the one that we call marble. At the same time," marble " properties can have objects that are not marble in the proper sense of the word, i.e., as a historically originated material for construction. And these are not necessarily the objects that we usually call marble because of their "marble" properties. If the name that serves to mark the content, "released" in the course of practical activity with the objects involved into the process is identified with the objects themselves, this causes conceptual confusion of the objects (as fragments of the objective reality existing independently) with their "properties" that are used in the activity processes and due to it have become some subjects of activity in the system of social production.

What is an object in itself, so to speak, independently of us? It is Kant's "thing in itself", which is revealed as a "thing for us" only to the extent of development of social production and, accordingly, "registration" as a human "thing" that sometimes appears only as a re-

sult of public knowledge (and therefore awareness) of the various properties of these "things in themselves" and their "humanization". Indeed, what is meant is a social in its origin and in its content, although not always conscious knowledge of the object various properties, revealed in the process of working with these objects — the process resulting in making them different "subjects". So, it is in the guise of different subjects that the object appears, one and the same as it would seem. In fact, the object always appears to us in the form of this or that "subject" only to the extent of disclosure of those properties and characteristics of the object which became somebody's subject of activity in the strict methodological sense, adopted in scientific activities. In other words, it is what we should reveal in the course of this activity, if our hypothesis about the presence of these previously hidden properties in the object of research is justified.

Consequently, we can "see" the actual "natural" properties of an object only to the extent of their "humanization", or, what is the same thing, "subjectification", of their "socialization", which "made" these hidden from us properties and characteristics of the object as a fragment of objective reality a particular social "object" and, accordingly — a certain social relationship.

Moreover, we can "see" their "objective" characteristics only if and to the extent that each of us already "identified himself" in his individual-public life as a specific social subject of a certain clan or tribe, of the level of development of its psychological capacities, types of interests and occupations, as a specific carrier of human abilities, a system of ideas and concepts specific to this particular society.

And if the ancient Greeks saw in the surrounding "nature" — stones, trees, streams, etc., numerous and quite real for them representatives of the Pantheon of their gods, then the modern Philistine, deprived of this "direct-sensory perception" of mythological reality, just "sees" stones, trees and streams. However, after becoming a geologist, for example, he begins to "see" hundreds of different minerals in the stones. If he becomes a botanist, he will distinguish hundreds of "species" of different plants in the grass common to others, etc., etc.

It is not without reason that some time ago when developing the concept of professional consciousness formation, I emphasized that the basic level of development of professionally significant psychological neoformations of the future professional's activity is the "subject" level of awareness of reality [30].

That is why each object involved in the most complex system of human relationships that arise in their joint activities, appears with its own completely different, but already "humanized" sides and functions, i.e. in the form of the activity results which thus appear as different "subjects". We must always keep in mind that any "natural" object, considered as if by itself, in reality — within the framework of human activity — always represents a "sensual" abstraction [3], an "objective mental form", as E.V. Ilyenkov emphasized after Marx [13] which appears in consciousness as a "quasi-object" (M.K. Mamardashvili) [26].

It is not useless in this connection to recall again the words of Karl Marx who noted that in the process of human development as a species, that "direct" sensory reflection, it would seem, naturally turned into a practical-theoretical activity. «… The senses, "wrote Marx," have become theorists directly in their practice. They are related to a thing for the sake of a thing, but this thing itself is an objective human relation to itself and to man, and vice versa» [28, p. 592].

Therefore, we emphasize once again: any fragment of objective reality — from a methodological point of view being an infinite and inexhaustible universe of various properties and characteristics, which only in tool-mediated and subject-oriented activity acts as a particular "subject matter", become, as A.N. Leontiev wrote in his time, a kind of "quasi-measurement" of the objects of our activity [18, p. 253].

Bearing in mind numerous data of specific psychological studies, for example, analysis of the diverse phenomena of perception, including the phenomenon of its constancy, the perception of dual images, tables of Rorschach test, originally used to analyze the efficiency of imagination, a variety of illusions and deceptions of vision and hearing, various forms of hallucinations, the effects of the so called procedural knowledge, demonstrating the phenomena of abstract interpretation of the objects of our activity, etc., we must admit, that any object of our activity can appear to us only as a "subject", i.e. as the result of our previous activity with this object, demonstrating its properties more or less clear to us, since we "discovered" them in the course of our activity with this object.

As noted by K. Marx, "during the labor process labor is constantly moving from the form of activity into the form of existence, from the form of motion into the form of subjectiveness" [29, vol. 23, p. 200]. I would like to emphasize that such treatment of the origin and essence of the "subjectiveness" as the essential feature of human activity is based not only on numerous empirical data from psychological research, but also on the fundamental base of methodological analysis demonstrating that activity is the essence of a person's attitude to objective reality.

So, even Spinoza wrote that any thing can be described through its various characteristics. But the best definition of a thing is the one that describes the way it occurs: "If a given thing is created, the definition must, as we have said, contain the immediate cause. For example, a circle according to this rule, — Spinoza notes — will need to be defined as follows: it is a figure described by a line, one end of which is fixed, and the other is mobile" [38, p. 352]. It is obvious that Spinoza is referring to a compass by which we can create a circle and which can already be described mathematically as "the geometric place of points equidistant from the center".

Therefore, a person, due to the socio-historical nature of his activity, always indirectly (regardless of whether consciously, i.e. aware of this, or intuitively, i.e. unconsciously) masters objectively new to him properties and characteristics of some fragments of the objective world.

He performs it through the modes of activity he is mastering or has already mastered and by way of tools that serve for these properties transformation in his activity. This is true even if we are talking about such a primary form of a person's activity as "subject-manipulative game" emerging in the course of joint activity during the first months of a child life. In doing so he relies on concurrently establishing social assessments and attitudes, the "ingrowth" into which since the first days of his life — from the one side — and "cultivation" of which — from the other — [12] make him a specific person.

The problem, however, is that we often do not notice that the very "selection" by the child of a particular "aspect" of the surveyed "object" is the result of his always specialized and specific activity with the actual object as a fragment of the objective reality, due to which the object does not only reveal itself as a potential "carrier" of these new properties, but appears as another "subject" — the curtailed activity or some possible mode of activity with this object.

That is why we should consider so important these initial stages of child' subjective world.

In our minds we, through the pre-existing appropriate modes of activity, not so much "reflect" the objective world as always transform (and, sometimes, distort) the world in accordance with the needs and motives which develop or already have developed in the past making our life and activity a vital-biased process. A person can go beyond his own existing ideas only through his real activity, which transforms (even ideally) the object of this activity into another "subject" and allows, thereby, to transform previous ideas.

From the psychological point of view, an object has no properties before acting with it but in the course of a person's "subject-oriented" actions with regard to this object, it is constituted by the person as the "subject" of his new need.

Therefore, the most important characteristics of any subject are, as Spiniza noted, certain schemes of activity with the object, which allow us to recreate this subject. Thus they appear as a motivationally significant psychological "summary" of our subject-oriented activity with the object. As A. N. Leontiev not once noted, in fact, by means of tools we are "scooping out" from the object those properties and characteristics which, thanks to the emerging and developing needs and the appropriate modes of activity become our motives, i.e. the subjects of our needs [17, pp. 182—205].

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Note that in parallel with the development of the ideas of the activity approach laid down in the domestic psychology by the works of L.S. Vygotsky [5; 6], P.Ya. Galperin [9], A.N. Leontiev [16], S.L. Rubinstein [35], D.B. Elkonin [41] et al. in the 60s—70s of the last century, the problems of communication were also actively studied [1; 23; 24; et al.]. Namely, communication as a process was considered as directly associated with the subject matter of the human practical activity,

which is aimed at the transformation of the reality conditions. Within that context communication was also treated as the internal moment of the activity serving its tasks.

Some authors held that in certain cases communication itself can be considered as a "common type of specific human activity" [27, p. 12], the subject of which is another person, and accordingly, the task of which is to build and maintain relationships with other people, or, as noted by A.K. Markova, "this is the activity focused on solving the problems of social communication. Social communication includes contact with an individual and interaction with society, direct practical cooperation and exchange of ideal values, etc." (Ibid, p. 12). It is obvious that in this case, the subject activity itself is viewed only as a moment of communication, serving its purposes.

Thus, depending on the context of the study and the interests of its authors, subject activity and communication were interpreted primarily as different forms of human activity, sometimes organically complementary [2; 36; 39] or, on the contrary, excluding each other, since the former was usually seen as the impact of the subject (subjects) on objects, and the latter — as interaction of subjects with one another [25]. It seems that today this is the most common view on the relationship between the subject activity and communication in their various forms, which actually persists in both domestic and foreign psychology [14; 40].

However, some authors believe that communication cannot be considered as an activity at all. For example, S.D. Smirnov, one of A.N. Leontiev's closest collaborators, who made a significant contribution to understanding the mechanisms of perceptive activity, in the 2000s directly opposed the concepts of activity and communication, pointing out that "the idea of asymmetry (S-O) — the directed impact of the active entity on the object he transforms — was laid in the concept of activity from the very beginning" [37]. In his opinion, the difference between activity and communication is the difference "between two fundamentally different types of reality (emphasized by me — N.N.): the mediated relationship between people and direct communication face to face. The latter is particular for its high intensity of "motivation birth" processes and can be characterized by almost complete not expressed purpose. It is such communication that is sometimes called personal, deep, authentic, productive, etc." [Ibid.].

It seems, however, that S.D. Smirnov, "diluting" activity and communication in such a radical way, did not see that, in fact, he contrasts what he treats as different points but what are, rather, different aspects of the developing joint activity process unified at its core. What for S.D. Smirnov appears as the central feature of communication is a very important, but just one of the moments of the process where the motivation of the activity is formed, namely the stage of the "subjectification" of the newly born need. So it appears to be naturally associated with the occurrence of the new element in the existing motivation structure of the personality fraught, sometimes, with restructuring of the whole motivation

structure which as a rule, is acutely experienced by the subject.

A.S. Pushkin as a great connoisseur of human souls described similar experiences in the poetic novel "Eugene Onegin". I can't help but mention a fragment of Tatyana's letter to Onegin, in which Tatiana writes:

"... You'd scarce arrived, I reckoned
to know you, swooned, and in a second
all in a blaze, I said: it's he!" [34].

For a psychologist who is particularly familiar with the works of Konrad Lorenz, it is obvious that here Pushkin describes the phenomenon of imprinting, accompanied by an "intense" experience of objectively occurring "subjectification" of the existing need. But, as A.N. Leontiev emphasized, the scientific, actually psychological understanding of such experiences requires an analysis of the activity within which this personally significant experience is born, testifying to the formation of the motivational basis of the newly emerging activity. However, the process of "subjectifying" the need is only a psychological condition for the deployment of activity as a process of transformation of its existing conditions that promote or, on the contrary, prevent the achievement of the desired. The plot of the novel "Eugene Onegin" shows that the actions through which its characters tried to implement their motives were inadequate to the circumstances. To show "the truth of the passions in the proposed circumstances" (A.S. Pushkin) is the task of the poet as an artist. But from a scientific-psychological point of view, the direction of such actions, of course, is determined by previously emerged, sometimes unconscious motives of the subject.

However, their achievement and, consequently, the satisfaction of related needs, is always carried out under certain conditions, which, in fact, make the psychological basis of birth of the goals more or less adequate to these motives and of the appropriate actions responsible for their implementation. The performance of the actions involves modes of actions or, in the words of A.N. Leontiev, operations, that are specific for the given conditions. Through them the activity and, respectively, the subsequent actions that make up its subject matter are realized [20, pp. 253—259].

Therefore, A.N. Leontiev as a researcher of the laws of personal development has repeatedly emphasized that the main psychological mechanism for the birth of motivation, characteristic of human activity, is the "shift of motive to goal". What is meant here is the moment when the specific goals of actions "subjectifying" in the form of the respective ways and means of satisfaction of the needs that brought to life these goals become motivationally significant and, accordingly, turn into new motives. As A.N. Leontiev wrote, "personality formation involves the development of the process of goals formation and, accordingly, the development of the subject's actions. Actions, becoming more and more rich, seem to outgrow the circle of activities that they implement, and come into conflict with the motives that gave rise to them. <...>

The internal driving forces of this process lie in the initial duality of the subject's connections with the world, in their dual mediation — by the object activity and by communication (emphasized by me — N.N.). Its deployment generates not only a duality of motivation for actions, but also their subordination, depending on the objective relations that open up to the subject, who enters into them" [18, pp. 210—211].

It is obvious that the emergence of new forms of joint activity and their individualization, associated with a constantly developing motivational structure of activity, requires from the subject to search for means to achieve these newly emerging motives and master the ways of their implementation, i.e., updating and/or creating new appropriate actions. At the same time, the former modes of activity, turning into an operational fund of activity, continue to be its necessary organic components. Unfortunately, this is systematically ignored in many studies, seemingly based on the activity approach.

In this connection A.N. Leontiev warned against some possible disregard of one of his fundamental ideas that laid the basis of the activity approach. According to him, activity, action and operation do not represent certain separates that can be considered by themselves, so to speak, outside the system of activity. "If you subtract mentally from activities actions, operations or from the operations — functions," Leontiev said, "you will get a hole from a bagel. It's not separate, it's not objects, you can't say that the activity is made of -... Activity can involve a single action. It then does not add up to anything, it is this action, the action can include a single operation. It is this operation and at the same time action. In short, they can not be considered as some bricks, only different. It's not going to work out that way." [20, p. 253].

Of course, while recognizing after A.N. Leontiev the inseparability of the structural elements of the activity, through which its motives and goals are realized, we can note that the system of relations between the participants of this joint activity in the context of which its tasks are solved remains outside the focus of the activity approach studies.

In this connection it is possible to partially recognize a certain correctness of the point of view of S.D. Smirnov, who mechanistically separated "activity" and "communication". It is obviously connected with the fact that in the framework of the classical version of the activity approach researchers did not fix the dual nature of tasks that are solved in the process of activity at different stages of its development. Moreover, the ambivalent and therefore contradictory nature of the activity itself should be highlighted as the one that determines the trajectory of human ontogenetic development.

As K. Marx wrote at the time, "the individual is a social being. Therefore, every manifestation of his life — even if it does not appear in the direct form of a collective manifestation of life performed jointly with others — is a manifestation and affirmation of social life" [28, p. 590].

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A.L. Wenger rightly notes,"... the concept of joint activity was on the periphery of the interests of most researchers. Meanwhile, in our opinion, it is still the most

important tool for studying child development [4, p. 18]. In this context referring to L.S. Vygotsky he underlines the significance of the child's relationships problem: "... the central factor, from the point of view of L.S. Vygotsky, remained "overboard" — the child's relationship with society (embodied, first of all, in his relations with close adults)» [Ibid. p. 17].

Unfortunately, researchers often fix such relationships in a superficial empirical form, considering them only as a self-evident condition for any activity, thereby ignoring their psychological essence and role as the way of communicative regulation and self-regulation of activity in the subsystem of relations between people.

In fact, naturally "maturing" in joint activity, a person's relations to others cause those deep psychological changes in the system of joint activity, which, in turn, determine the person's capabilities and success in implementing subject-oriented transformations in the of activity conditions.

Thus, the basis for a serious theoretical elaboration of the relationship between subject activity and communication is the idea of joint activity as having a "dual" or even ambivalent essence. In other words, joint activity as a process of instrumental transformation of the objectively given conditions of activity is always carried out in a certain social situation of human development since a human being is a subject of numerous connections and relationships with other people. It is these relationships that not only mediate various forms and types of social interaction but constitute its essence.

Obviously, such an approach should be the basis for a new formulation of a number of fundamental problems of psychology. The first in this context is the problem of internal contradictions in the process of the developing joint activity. These contradictions determine both the nature and content of a subject psychological capabilities that are developing within the frames of joint activity. The joint activity sets the system of the subject relations, within which the subject learns and then creates the necessary modes of tool-mediated and therefore always practically-oriented activity, implementing them into a subsystem of communication with others, which is to ensure the success of this interaction.

Meanwhile, as A.N. Leontiev rightly emphasized, the very process of implementing the modes of activity that the subject masters would cause natural changes in the system of relations, the implementation of which can be facilitated or, on the contrary, hindered by other participants in joint activity, sometimes without even knowing about their participation. Thus, there appear the changes in the nature of the subject's interaction with objective conditions presented in one way or another in his subjective world, including the system of his relations with other people. And as shown by the analysis conducted by M.K. Mamardashvili, the content of this subjective world is not always adequate to the objective situation of participants in this joint activity [26].

From this point of view, it is obvious that when conducting research that is consciously based on the activity approach, it should always be about analyzing the interrelations of two subsystems of joint activity, which,

as shown in our works [31; 32], not only determine each other, but through each other realize their potential in the system of joint activity. As the analysis shows, changes in a particular subsystem generate objective contradictions in the system of activity, the strengthening of which, under certain conditions, naturally gives rise to development crises. The process of their resolution triggers the main psychological mechanism of the development of the subject of activity [32].

In fact, these contradictions are a constantly arising internal conflict between the different ways of regulating the real interaction of subjects of joint activity in solving problems of changing the conditions of their real existence in connection with the emergence of new needs. As noted by Karl Marx, "... the fact is that the satisfied first need, the action of satisfaction and the already acquired instrument of satisfaction lead to new needs, and this generation of new needs is the first historical act" [29, vol. 3, p. 27].

The success of these actions is conditioned by the degree and quality of satisfaction of the subject needs through subject-oriented actions aimed at achieving motives that meet these needs. However, in the activity system, this success depends on the measure of coordination between the participants in the joint activity concerning the modes of the actions used by them. It is obvious that the coordination of efforts in solving these vital tasks of practical transformation of the conditions of activity by the subjects of joint activity is carried out in their communication subsystem. So, they use various means of communication [7] thus achieving the goals of the joint activity organizing and regulation.

Thus, we can take a different look at the problem of the relationship between communication and practically oriented and tool-equipped subject activity. Communication as a way of joint activity organizing and regulating is not only crucial for ensuring the productivity of subject activity but it also provides for the development of consciousness. The human consciousness is viewed here as a specific form of coordination of the very process of human capabilities psychological development and also as the means of the person's activity self-regulation. These functions implementation ensures systemic and semantic structure of the consciousness, to understand which is sought by L.S. Vygotsky [5, vol. 1, pp. 132—148].

In this respect it is necessary to support P.Ya. Galperin's attempt to analyze the process and results of anthropogenesis, the consideration of which, in his opinion, is of paramount importance for the development of scientific psychology. He noted: "Another, also functional side of this process (anthropogenesis — N.N.) is that there is a division of mental life into relatively independent forms, which we usually distinguish as perception, memory, imagination, thinking, feelings, needs, will, etc. Consciousness itself stands out as a special element, as a special form of relations to other people and to itself, following the pattern of how other people relate to themselves and to me. All this happens in the process of the formation of human society and the formation of people themselves" [8, p. 135].

However, in the course of ontogenesis this process is also carried out in a reduced form in relation to anthropogenesis. Of course, I do not mean the version of the biogenetic law that was overcome in psychology at the beginning of the last century. The process of psychological development of the child is not a process of deployment of certain potencies and intentions that the child carries in his body. The whole pathos of cultural-historical psychology and the activity approach to comprehending the laws of development of each person entering this world could be defined as follows: child development is the process of his entering into a system of joint activities, the specific content of which becomes his psychology.

However, the psychological capabilities of the child are developing only to the extent of its own activeness, which always turns into some form of subject activity ready to meet the tasks arising in the course of development. This activity is always undertaken within the changing social circle which expands with the development of the child and in which some new requirements in relation to the child naturally emerge. They mostly respond to the changing possibilities of the child participation in joint activity.

Due to this, each child is constantly forced to actively develop its own forms of behavior, thereby "appropriating" the necessary forms and modes of joint activity, always to the extent of the available level of psychological capabilities for interaction with adults and further on. This is what naturally generates certain internal contradictions in the development process of each individual, the resolution of which is the main source of this development with all its pros and cons [32].

A newly born infant who screams his entry into the adult world must go through all the necessary stages of finding his human destiny. And the initial stage of this development can only take place in such a form of joint activity, in which this "co-operation" manifests itself in such a way that the child acts through the actions of the mother. The importance of this basic form of joint activity D.B. Elkonin noted in his scientific diaries: "26.4.1970. … the separation of the Self from the "Great-we" is associated with a radical change in the structure of the child's activity. At the earliest stages, this is, in the true sense of the word, a joint activity in which the adult acts together with the child. There is no child's independent actions at all, since the adult acts with the help of child's hands (only gradually some links produced by the child itself are isolated)…" [41, pp. 500—501].

These initial forms of joint activity only make the basis. With its further differentiation those individual forms of joint activity occur, in which the psychological uniqueness of the originating personality realizes itself. Moreover, their further evolution sets a specific trajectory for the child establishing as a subject of a certain social community. As Marx noted, man in the process of activity "…produces himself in all his integrity, he does not seek to remain something finally established, but is in the absolute movement of becoming" [29, vol. 46, part 1, p. 476].

Conclusion

Thus, the duality of joint activity is a product of a person development within the system of social reproduction of his life activity. It is an essential, even if full of contradictions, feature of his existence as a social individual, which in fact determines the emergence, development and subject differentiation of all psychological neoformations that characterize a person as a representative of a particular community. This affiliation, accordingly, determines the specifics of the person's participation in joint activity with others, always carried out in the system of his already established or establishing relations to certain social groups. They set the context in which this activity takes place, and which in one way or another implements the person's relations with the world as a whole.

However, when studying the psychological profile of a person as affected by his involvement into the joint activity, this duality sometimes seems to be eliminated. In this case, the relevant aspects of activity are considered abstractly, in their metaphysical isolation from each other. Somehow this hinders a deeper understanding of the fundamental fact that the "subject" aspect of joint activity, expressing the matter of the person's psychological capabilities to really and/or ideally transform the image of reality, also determines the content of the activity "communicative" aspect. The latter, manifested through a system of specialized communicative acts, serves as a necessary condition for the implementation of the "subject" aspect of activity by the person while the potential of the communicative aspect is realized through the "subject" transformations of the objective reality in the system of joint activity.

There is a natural differentiation of these aspects in the process of the joint activity development, however, each of them "holds" this duality. As a result, this leads to the deepening of the contradictions that are inherent in each of these aspects of the unified process; their resolution is carried out in the course of development of joint activity, as the basis of the person' development.

In this regard, a researcher of a particular person's activity process has to consider the contradictory unity of a "subject" action and communicative act as mutually determining moments (aspects) of joint activity. Both naturally emerge since the first moments of each individual's life due to his initial "immersion" in the system of social relations. It is these mutually affecting aspects of joint activity that determine the relationship of an individual with the conditions and factors of the objective reality which in the process of the activity development become its subjects and means.

Thus, only disclosing the psychological laws that underlie the developing child-adults system of relations, from the one side, and various "subject" actions the child is mastering — from the other, one can understand the psychological "mechanisms" affecting the entire system of "subject" awareness of both the conditions and modes of these actions in the course of activity since their psychological transformation depends on the whole context of the joint activity. From the other side, only by studying

the specific various forms of the "communicative" awareness of the goals, conditions and modes of subject activity which takes place in acts of communication one can reasonably understand the psychological patterns of development of these modes in the context of joint activity.

It seems that this view, based on the dual nature of joint activity opens up the possibility of developing the activity approach. Here we are talking about a certain reinterpretation of a number of provisions that have received the status of axioms in Russian psychology. Obviously, there is a need of rethinking certain moments of L.S. Vygotsky's theoretical vision of cultural and historical psychology with its main focus on the communicative aspect of joint activity, which determines the development of consciousness as a system of regulation of human activity. It seems that the potential of this outstanding theory may not be fully developed and it should be interpreted in a new way.

Just as important is the possibility of the new understanding of many provisions of A.N. Leontiev's theory of activity which reveals the role of "subject" activity in the process of formation of the main psychological neoformations that characterize human development.

Obviously, we are only at the beginning of the road.

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«Двойственность» совместной деятельности как основа становления психологических новообразований: пути развития деятельностного подхода

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Статья посвящена анализу методологического статуса категории совместной деятельности и ее роли в раскрытии психологических механизмов развития человека. Особое внимание уделяется содержанию терминов «объект деятельности» и «предмет деятельности», которое определяет понимание основных характеристик деятельности как процесса орудийного преобразования объекта деятельности в ее предмет, воплощающего собой осуществленный способ деятельности. Ключевыми пунктами анализа деятельностного подхода А.Н. Леонтьева являются положения об источниках, условиях и психологических механизмах деятельности, определяющих внутреннюю динамику развития ее про-

тиворечий. Эти противоречия возникают в ходе изменений в предметно-орудийной и коммуникативной составляющих совместной деятельности, которые выступают, соответственно, ведущими формами преобразования предметной действительности и средствами организации взаимодействия субъектов в рамках решения задач совместной деятельности. Подчеркивается, что именно через способ деятельности выражается ее двойственный характер как системы, включающей предметно-орудийную и коммуникативную составляющие. Противоречия, вызревающие в этих составляющих деятельности, разрешаются путем их взаимообуславливающих трансформаций, что ведет к изменению мотивационной основы деятельности, определяющей развитие предметно-орудийных способов действий, которое, в свою очередь, приводит к развитию способов коммуникативной регуляции системы отношений.

Ключевые слова: совместная деятельность, объект и предмет деятельности, коммуникация, способ деятельности, способы действия, развитие, система отношений, общение, мотивация, противоречия деятельности.

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Educational Program "Thunderbolt Hunt": An Analysis with the "Experimental-Genetic Method"

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This paper attempts to transfer L.S. Vygotsky's experimental-genetic method in Science Education and, furthermore, into non-formal settings. The nature of Science Education in early school grades as well as the flexibility and the need to some extent of incorporating arts in Science Education indicate that experimental-genetic method may be applied as a useful tool of analysis which will provide in-depth insights about the learning process. The method was applied to the data, collected from the implementation of the educational program «Thunderbolt hunt» at the Archaeological Museum of Ioannina, Greece. Unlike many other courses, this educational program is based on the museums' exhibits and introduces concepts of science as well as cultivates scientific method. In this paper a meta-analysis of the implementation of the program to a first grade of a public primary school is presented. The data analysis shows explicitly the relation between the formation of the concept of air and the social relations and interactions between the students. The combination of transcending the misconceptions about air, conducting experiments and trying to adapt a new way of working result in a lot of contradictions while at the same time give space for reflection which altogether create «the dramatic character of the organized interaction».

Keywords: experimental-genetic method, non-formal setting, science education, pereghivanie.

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Introduction

This paper attempts to transfer experimental-genetic method and more specifically the approach of O. Rubtsova and H. Daniels (2016) in the field of science education considering the incorporation of drama and arts in science education. In the paper «The Concept of Drama in Vygotsky's Theory: Application in Research», the authors interpret Vygotsky's general genetic law of development considering the cultural-historical context in which the theory was developed, in light of the strong influence of Vygotsky's theatrical background on his ideas and the terminology he used. According to L.S. Vygotsky's general genetic law of development [17 as cited in 13]: «... any function in the child's cultural development appears on stage twice, that is, on two planes. It firstly appears on the social plane and then on a psychological plane. Firstly, among people as an interpsychological category and then within the child as an intra-psychological category. This is equally true with regard to voluntary attention, logical memory, the formation of concepts and the development of volition».

Researchers such as N.N. Veresov and M. Yaroshevsky have provided valid information about the Rus-

sian terms in Vygotsky's work which are hard to accurately translate into English. It is therefore clear, that the two planes to which Vygotsky refers, exist on the same stage [15] and when these two planes come to a point where they collide, due to the divergence between the personal understandings and the social situations, opportunities for development may appear [13]. Vygotsky, placing the «category» on a theatrical stage, expected that there will be conflicts, contradictions between the actors in terms of their social relations and that due to these contradictions the participants of the interaction will experience a «dramatic event», which will then «become the intra-personal category» [15].

The term «category» which appears in drama, involves «perezhivanie». Vygotsky [18 as cited in 13] describes the term as «the emotional experience [perezhivanie] arising from any situation or from an aspect of his [sic] environment, determines what kind of influence this situation will have on the child» focusing on the relations between an emotional experience as well as the situational characteristics which are also experienced [4]. M. Fleer [4] lists different ways in which the term «perezhivanie» is used in research, as a unity of emotions and cognition, which goes beyond the emotionally experienced situation itself and focuses on the child's consciousness and awareness of the situation, as a prism, that provides the lens which makes the relation between the child and the environment visible, as a unit of analysis, that refers to the characteristics of the whole which won't be corrupted and will retain their «properties inherent in the whole», as a double subjectivity in play/art, where the actors can be engaged in different emotional states on the stage, where one state may be connected with the feeling of performing, and another one can be the subject of his/her performance.

Children of young ages tend to relate with their social and material world emotionally [5]. In the field of science education, this is an important insight which could contribute to understanding students' experience and how they learn science by experiencing the interactions with and within their social and material world. Consequently, according to «perezhivanie», students' imagination, concept formation and emotions should be regarded as a unity, rather than perceived separately [5]. According to M. Fleer and N. Pramling [5], «... we conceptualize science education as an indivisible unity of what the child brings to activity setting in the preschool, the situational characteristics that are created by the teacher, as well as how these events are emotionally and conceptually experienced by the child. Together these represent the emotional experience of perezhivanie of the child's social situation of development.».

All the above is intensified if we consider science education in particular and STEM disciplines in general, as fruitful grounds to integrate arts. The literature highlights the advantages of integrating different forms of arts in STEM disciplines, for the promotion of innovation, creativity, critical thinking, cooperation, effective communication [11]. Especially in early childhood education, this approach seems even more appropriate given the students' needs of that age. Therefore, designing interventions or

educational programs adopting an approach such as the "conceptual play worlds" which combine a plot, characters, drama, problem-solving situations and play [3] may be efficient for engaging students in learning and adopting a positive attitude towards science education [3; 10].

A brief overview of the research project

The research project described in this paper was conducted in 2017—2018 in Ioannina, a city in northwestern Greece. In the framework of the research an educational program was designed for the Archaeological Museum of Ioannina for students from 4 to 9 years old. The educational program, «Thunderbolt hunt» was offered to classes of public as well as of private schools of Ioannina. Unlike the rest of the museums' educational programs, it was introducing concepts of science education and cultivating scientific method, while at the same time it was designed based on the museums' exhibits and collections [7]. The idea was to combine cultural communication and science education enhancement with a long-term aim of developing a positive attitude to museum and science in students [10].

Description of the Educational Program «Thunderbolt hunt»

The educational program is designed to introduce scientific concepts in the framework of the cultural-historical activity theory. It differs from the typical educational programs, because it promotes scientific methods while at the same time it is designed to be implemented in museums of general interest. The design process of the proposed educational programs (SciEPIGI — Scientific Educational Programs for Informal settings of General Interest) incorporates a number of distinct characteristics/steps, including: 1. definition of the target group (age, level etc.), 2. connection of the museum exhibits with science education concepts, 3. link to the science education curriculum, 4. collaborative learning, 5. learning by doing, 6. balance between free choice and guidance, 7. instructor's role, 8. teacher's role [8]. This paper does not focus on the design process hence the above characteristics won't be further analyzed.

The educational program «Thunderbolt hunt» consists of 7 activities and lasts 90 minutes. There are activities that cultivate scientific method (2 & 4), games (6), activities which incorporate drama in education (5 & 7) and the plot of the program which introduces students to a problem-solving situation (3). The individual activities are briefly described below.

1. Group formation and discussion about museum exhibits: students are welcomed in the collection room «Dodoni». They are taking one card which illustrates an exhibit. The cards form three groups of students. A discussion takes place about the cards and what students think they represent.

2. Search for museum exhibits — The common element: the first task for the groups is to use the tools giv-

en (magnifiers, torches etc.) in order to find the exhibit which is illustrated in the group's cards and observe it. When all the groups find their exhibit, they describe it to the rest of the groups and altogether try to figure out the common element which is the thunderbolt.

3. How was the thunderbolt lost? — Narrative: this activity constitutes a narrative about Dodoni's oracle, which is pictured on the wall, and explains how Zeus lost his thunderbolt when Aeolus set his winds free from his sack without warning Zeus. Now Aeolus is accused, threatened for his life and ordered by Zeus to find the thunderbolt. Aeolus turns to students for help.

4. Experiments on air: the common element of activity 2 gives students the pass for the next task, which is the experiment about air and its properties. Students do the experiments by using the materials given in boxes (balloons, straws, syringes, plastic bottles with or without a hole etc.), test their hypotheses, communicate their findings, draw conclusions and gather data in order to help Aeolus by giving him advice on where and how to find the thunderbolt.

5. Role on the wall: students draw or write their advice and give it to Aeolus. He is pictured on a big paper and students glue their ideas on his head, so that he can think and choose the best idea to find the thunderbolt.

6. Zeus' winged thunderbolt: while he is as fast as the wind, Aeolus shortly and secretly leaves pieces of the thunderbolt to the instructor and students must assemble the pieces of the puzzle to get the Zeus' thunderbolt.

7. Aeolus' sack: Aeolus surprises students with the last task which is aimed at decompression. Before students leave the museum, they are asked to gather Aeolus' winds and put them back into his sack which is left to the instructor. When all the winds are in the sack one or more students tie the sack with a band, so that the winds don't escape [8].

Implementation

In this paper the implementation of the educational program for the 1st grade of the 24th Primary School of Ioannina is described. The numbers correspond to the individual activities of the program.

1. Students were speaking altogether. They were interrupting their classmates and they weren't following the rule of raising hands when they wanted to speak.

2. They were so impatient to start the activities that they didn't even let the instructor give instructions for the activity before they start. As a result, they were asking questions about the instructions of the activity after the activity had started. In the beginning, they were attracted by the tools (magnifiers, flashlight etc.), so they didn't immediately start observing the exhibits of the collection. They were getting excited when they were locating their group's exhibit in the collection, but soon, they were losing their interest on observing them in detail as they were instructed. Then, they were just expecting the next activity. The instructor had to encourage and motivate them to observe closely the exhibit, so

they could find the common element when all the groups would share the characteristics of theirs.

3. They were making connections of the narrative with their everyday lives and they were associating life in Dodoni with elements of their own lives (the stadium, the city, the museum). They wanted to share with the instructor all the information they knew about Dodoni and its oracle, especially those who had recently visited Dodoni. At the end of the narrative, students were asking questions about the rest of the educational program and its activities and whether they would find a real thunderbolt in the museum, the one which was lost by Zeus. Then, they started questioning Zeus' power and discussing how weak he would be without his thunderbolt.

— Nefeli: If he didn't find his thunderbolt, he wouldn't be very strong anymore.

— Labros: Yes, without his thunderbolt he would be useless.

— Nefeli: He wouldn't be able even to strike.

— Iasonas: He wouldn't even be a God; he would become half-god without thunderbolt.

— Yorgos: He could change his power. He could take some fire from Hephaestus.

4. When the instructor gave the signal to find the boxes with the tools for the experiments, students started running around and they were getting very excited when they were finding their group's box. They were opening the boxes impatiently and they started using the experiments' materials without waiting to see whether the instructor would give further instructions. The instructor gave some time to students in order to look into the materials. A lot of students started using the materials unconsciously according to the experiments' process. Then, the instructor went through all the groups and motivated the students to conduct the experiments of the educational program. During this process, some students discovered new ways of using the tools (using the syringe or the straw to blow the balloon into the plastic bottle or placing the straw into the bottle's hole and pushing the balloon out of the bottles' lip). When they were conducting the experiments successfully, they were bragging about their achievements to their classmates or their teachers. Instructor's role especially in this part of the program was adjuvant. She was answering students' questions when it was necessary, and she was asking questions to students to promote scaffolding so that the students could expand their thinking and infer their observations from their experiments. As far as the rules of the community are concerned, students didn't successfully follow them while they were talking very loudly despite instructor's reminders. There were also conflicts among students while they were sharing the materials for the experiments. As a result, instructor kept reminding the rules of the community, particularly those about collaboration between the group's members. Apart from the violation of rules and the arguments, students were willing to share the results of their experiments and their group with their classmates or other groups.

5. The instructor gave the instructions for the activity. Students were listening carefully to the advice their

classmates gave to Aeolus and they were speaking only when the instructor gave them the floor. During the drawing though, students were again speaking loudly, and conflicts emerged among students who were sharing the same crayons. The instructor was interfering when conflicts appeared to soothe the tensions and remind the rule of collaborative working.

6. There were just a few pieces of the and all of the students wanted to take one and place it next to the others. As expected, this resulted in tension and complaints. The instructor assigned some students on assembling the pieces of the puzzle. Students were very excited when the puzzle was complete and asked their teachers to take a photo of them with the completed puzzle.

7. During the last activity students listened to the instructions and followed them properly. Of course, they all wanted to make the knot to shut Aeolus' sack and keep the winds imprisoned. Therefore, the tension wasn't missing, but the band used was big enough so most of the students could make a knot.

Data analysis

Before the implementation of the educational program, the instructor didn't have any information about the students' background. She only knew the school which they came from (public primary school) and the grade they attended (16 first-grade (6-year old) students). There was no need to learn more about the participants, since the methodology according to which the educational program was designed and analyzed, focuses on what happens when it happens. This paper constitutes a meta-analysis of the implementation of the educational program «Thunderbolt hunt» at the Archaeological Museum of Ioannina, with the aim of analyzing its activities from the perspective of the experimental-genetic method. The use of experimental-genetic method aims for an in-depth analysis considering the formation of the concept of air as an indivisible unit of the situational characteristics of the learning community.

The educational program «Thunderbolt hunt» approaches the concept of air through the experiments of the fourth activity which includes three different experiments. All the materials are put into boxes, therefore the materials for the individual experiments are not divided. Students can use all the materials at the same time, and this gives space for students to process and use them as they wish and imagine in the beginning/ Later the students are provided with further instructions and challenges.

1. The first experiment aims to introduce knowledge about the existence of air as well as that air takes the shape of the container it is in, by squeezing an empty plastic bottle or capturing air with an empty plastic bag.

2. The second experiment requires syringes that students use to understand that air occupies space and that it can be compressed. We challenge them to close the opening of the syringe and try to push the plunger.

3. The last experiment demands empty plastic bottles, some of them with a hole on the bottom. A balloon is placed in the spout of every bottle facing inwards and the students try to blow in order to inflate the balloon inside the bottle. This experiment approaches the property of air to occupy space and that two objects cannot occupy the same space at the same time.

The most important is that the experiments are conducted in a learning community that differs from the usual classroom, they are placed within a story that introduces a dramatic dimension to students and to a problem-solving situation and they are designed within a play-based frame [3].

It is very interesting to observe how the concept begins to shape in the trajectory of the experiments through discussion and interaction among students. We meet the concept for the first time when the instructor introduces to the students the incident with Aeolus and Zeus in Dodoni. When the concept comes up for the first time, the instructor asks students to share with her their ideas about air, what it is, where we can find it etc. The following extract shows how students react:

— *We will learn something about air but why do you think we will do that?*

— *To find thunderbolt.*

— *Very well!*

— *Wherever is air there is rain and wherever is rain there is thunderbolt. (Dimitris)*

— *Very good. So, we will learn something about air to be able to help Aeolus to send his winds and find the thunderbolt. So, tell me, is there a way we can capture air? (instructor)*

— *No (a lot of students together)*

— *Please tell me one by one so I can hear you. Tell me Odyssey. (instructor)*

— *In something that will have no holes. (Odyssey)*

— *In something with no holes, tell me Yorgo.*

— *Something that won't have an exit. (Yorgos)*

— *For example, in here (the room), we couldn't because the air could escape (showing the corridor). (Giannis)*

— *We could in a vase. (Iasonas)*

— *In a vase, anyone else? Tell me. (instructor)*

— *In a box. (Sotiris)*

— *In a box, so according to what you say, if I take a bottle and close its cap very well, I can capture the air. (instructor)*

— *If you take a bottle then, you blow some air in it and then you close the cap. (Dimitris)*

In the expert alternative conceptions appear about air that show a correlation between the existence of air and its movement identifying air with wind. We thus verify the fact that students tend to believe that a still bottle does not contain air unless we move it sharply and fill it with air. At this point the instructor doesn't try to sway students on the right direction. The instructor doesn't want to force them to change their ideas, but to support them in order to make their hypotheses, observe during the experiments and come to the conclusions desired based on their vivid experiences, rather than on the instructor's knowledge.

At this point is seems that the students' misconceptions about the air are regarded as a part of their current social situation of development. It is obvious, in

the above expert, that the students' opinions and beliefs about the air change when their classmates' opinion changes, which highlights the significance of social interactions in learning. It also confirms the need for the «collective form» since only then we can expect potential changes in the social situation of development, which in its turn, will hopefully lead to the development of higher psychological functions [13]. In the beginning, a lot of students agree that there is no way to capture air. When the first student opposes this observation suggesting that there is a way, the same students change their minds and suggest more options for capturing air building on their classmate's idea but carrying the misconceptions along with their ideas. Instructor's attitude towards the students' misconceptions is the key that will lead students to discovering the concept by interacting with their classmates and fighting their own limitations regarding the concept.

The next step leads the groups to the boxes with the materials for the experiments. After they have seen and used the materials freely, the instructor challenges the groups to try blowing the balloons in the bottles and pushing the syringe's plunger having syringe's opening closed with their finger.

Students then start using and playing with the materials and the instructor observes the process and intervenes only when it's needed taking the role of the mediator. The first thing that attracts the students' attention are the bottles with the balloons, probably because of the balloons. Some of the students succeed to inflate the balloons and some don't. Those who inflated the balloons are satisfied with the result and they subsequently brag about their accomplishment «I have strong lungs» Giannis says. Those who didn't make it are quite disappointed and start wondering what they are doing wrong. «Why doesn't mine inflate? » asks Eleni anxiously. The accomplishers then start showing to others the procedure, how they succeeded. «Look, take a deep breath and blow it» Andriana demonstrated and the rest try again harder but still they can't succeed. When it seems that they have lost interest, but still haven't figured out why this is happening, the instructor intervenes and suggests, giving a hint, to observe their bottles and see if they are all the same or they have any differences. Different ideas come from students such as the different size of the bottles, the different colors until some of the students spot the holes on the bottom of their bottles. The student who discovers the hole first starts sharing the observation with the instructor then with the rest of the group mates and with the rest of the groups. Then everyone searches for a hole in their bottles.

Here is the discussion between the instructor and one of the groups:

— *I see Yorgos inflated the balloon, did the rest of you do it?*

— *No. (students)*

— *Why do you think is this happening? Is it because of the bottles, are there any differences between them? (instructor)*

— *This one has a hole (Yorgos)*

— *Oh, does it have a hole? (instructor surprised)*

— *I don't have a hole. (Mara)*

— *I will try to inflate it for you. (Adriana)*

— *Konstantina, does your bottle have a hole? (instructor)*

— *No (Konstantina)*

— *Can you inflate it? (instructor)*

— *No (Konstantina)*

— *So, what's happening, some of you can inflate the baloons, but some of you can't? (instructor)*

— *My bottle has a hole (Yorgos)*

— *Yours has a hole and why do you think it inflates? (instructor)*

— *Because the bottle has a hole (Yorgos)*

— *And what happens when it has a hole? (instructor)*

— *Miss, the air goes out. (Adriana)*

— *Oh, does the air escape from the hole? Is that what you mean Andriana? (instructor)*

— *While here it keeps the air inside and it can't be inflated. (Adriana while still trying to inflate Konstantina's balloon in a bottle without a hole)*

— *So, do you think that air takes up space and doesn't let the balloon inflate? (instructor)*

— *Yes (Yorgos, Konstantina)*

— *We have to make a hole on Konstantina's and Yorgos' bottles. (Adriana)*

Sophia is still trying to inflate her balloon even though her bottle doesn't have a hole.

— *Sophia, your bottle has no hole, it won't inflate. (Adriana)*

While students try the experiment with the syringes, the discussions continue:

— *Did you try to close the opening of the syringe and try to push the plunger? (instructor)*

— *Miss, it can't be pushed. (Angelica)*

— *Why? (instructor)*

— *Miss, I can't push it either. (Marina)*

— *I know, because it needs air to close the syringe. (Vangelis)*

— *You need air, you say?*

— *Miss, the air goes out. (Nefeli)*

— *If we close the hole? (instructor)*

— *It doesn't blow air. (Nefeli)*

— *So, what's inside the syringe? What doesn't come out of it? (instructor)*

— *The air! (Nefeli, Marina)*

After the experiments, the boxes with the materials were gathered and put aside, and the instructor asked the groups to share their findings with the rest of the groups and classmates in order to draw some conclusions.

— *Because the bottle has, it doesn't have a hole and the … air doesn't leave. And I can't inflate the balloon because the air takes up all the space. (Dimitris)*

— *Well done, did you hear what Dimitris said? There is air inside the bottle and that is why the balloon does not inflate. Wait for your turn, Vasilis will tell us now. (instructor)*

— *If it's the bottle and it doesn't have a hole, the air can't go away, if it doesn't … if it has a hole, the air will go away. (Vasilis)*

— Hmmm, when it has a hole, the air leaves then ... (instructor)

— If it hasn't the air doesn't leave. (Katerina)

— If it hasn't the air doesn't leave. Odyssey, what did you want to add?

— When we try to inflate it (balloon), it does not inflate, if it has a hole (bottle) we inflate it and it can go down because the air leaves the hole. (Odyssey)

— Hmmm very well. So, do you think that air takes up space? (instructor)

— Yes. (Odyssey)

— So, the air takes up space in the bottle and that's why the balloon doesn't inflate. Very nice and tell me about the syringe, did you try to close the opening and push the plunger? (instructor)

— Yes! (a lot of students together)

— I tried it with ... (Maria)

— One by one, tell me one by one, otherwise I can't hear you. Tell me Rafaela.

— Miss, we tried, but it didn't turn out the way we wanted. (Rafaela)

— Wait for your turn Maria. Tell me Rafaela.

— With the syringe the balloon does not take air. (Rafaela)

— Did you try to use it as a pump? (instructor)

— The syringe doesn't work but with the straw it works. (Rafaela)

— Oh, you did it with the straw.

The last sentences of the extract refer to an alternative way of using the materials. Students, while they were freely using the materials, conducted their own experiments. They tried to use the syringes as pumps to inflate the balloons in the bottles. Using the syringe as a pump, students realized that even though the balloon was inflating a little, when they were trying to pump again the syringe sucked up the air back, hence the experiment was not successful. Using the straw instead was more successful but again they could not use it to fully inflate the balloon because the opening of the straw was very narrow.

What we can conclude from the fragments above, is that students, working in groups, shared their ideas, formed hypotheses which they next tested, conducted the experiments/ planned in the program, as well as their own experiments, and drew conclusions regarding the concept, following a specific way of working, which is collaborative, interactive and gives more space for the students imagination and freedom.

What is also very interesting in the present research is the different way of working in the learning community, beyond the concept formation itself. In order to present this way, we will describe below how the three structural components of the activity system, the learning community, the rules and the division of labor, appear while implementing the educational program. The description of these three components will give a clearer interpretation of how the learning community, the rules and the division of labor shape the new way of working which contradicts the students' prior experience of educational programs in the Archaeological museum of Ioannina.

Learning community is the environment in which Activity unfolds and tool mediation takes place while at the same time the socio-cultural context of Activity is intertwined [2]. Within the boundaries set by the community, the subjects are trained not individually but collectively through their participation in the learning community [12]. In the case of the present research, the learning community is located in the archaeological museum, where the educational programs are implemented, and the participants are involved in educational activities.

The Archaeological Museum is connected in students' minds with the objects exhibited there, with archaeologists' excavations and with the restrictions regarding the rules. Usually, students' visit in museums like the archaeological, include guided tour focusing on certain exhibits in relation to their historical features and usefulness in the past. On the contrary, the educational program «Thunderbolt hunt» incorporates different features from those of a typical guided tour. The latter is illustrated by the students themselves who took part in the program,

«Last time we came only for the exhibits, we did not come to play. (Yiannis); Wow we will play! Yes! (Many students together); Miss, will we take the bags? (Adriana referring to the bags with the observation tools after activity two); Shall we roll up our sleeves? (Adriana before the experiments); Miss, will we take these experiments with us? (Ioanna); Guys, we will play another game! (Yorgos); Miss, when will we play it again? (Iasonas referring to the second activity) ».

Despite the strict rules of the learning community with the proper design and management of the program by the instructor, the Archaeological Museum provided a flexible learning environment for cultivating students in scientific methods as well as bringing them in contact with authentic cultural objects hence providing them with multiple opportunities to construct and interpret meanings [16]. Multiple representations incorporated in learning communities such as museums, make learning, learning for all, offering a welcoming environment for different students. An indicative example, which emerges from the field notes, concerns the participation and interactions of «naughty» students. It seems that «naughty», according to their teachers, students responded very well to the activities of the program and introduced concepts crucial for the course of the program and the achievement of the object. Students such as Vangelis and Andriana, who were very active in the program's activities were considered by their teachers as «not good students». This would be very interesting for further study in relation to the current public educational system and how it meets the needs of today's students.

The **rules** in the learning community can be expressed either explicitly or implicitly and can affect in one way or another the use of tools in the implementation of the Activity [9]. In the case of the museum as a learning community, both obvious and implied rules are manifested. The obvious rules of the Archaeological Museum's learning community include restrictions on

the behavior of visitors to the museum, prohibition of touching the exhibits, low voice volume, being quiet in the area without running and pushing, non-consumption of food and beverages inside the museum. The rules that apply to students' participation in the museum's educational programs more or less include the rules that apply in the school classroom, such as respect for classmates, respect for teachers and instructors who conduct the program and moreover, teamwork and implementation of educational program activities according to the instructions. It is therefore clear that the rules are characterized not only by interpersonal but also by socio-cultural aspects [6].

There were a lot of points when students were not following the rules, especially in the beginning and the instructor kept reminding the rules to them. It is noteworthy that most of her reminders were made during the transition from one activity to the other, when students were looking forward to carrying out the next activity and they did not have the patience to listen to the instructions first. They wanted to know if the previous activity was the last one, if other similar activities will follow, if they would use the same materials and tools as well as if they could take them with them after leaving the museum.

In every activity system, the **division of labor** takes place in a specific way and indicates who does what in relation to the object, i.e. which members of the community are involved in which actions using tools [6]. During the design and the implementation of the educational program, effort was made so that the instructor is not represented as a person of authority to students. In order to avoid a strictly hierarchical community, the instructor's role to the division of labor was attempted to be limited by shifting part of it to students who undertook the division of labor within their groups. Therefore, the division of labor was carried out at multiple levels. There was division of labor on an individual level, within groups and in plenary.

Instructor's role as a mediator was to coordinate the individual activities undertaking the time management, the transition from the one activity to the other according to students' interest or once it was completed, the provision of instructions for implementing the activities, the provision of information about the exhibits, tools and experiments, answering students' questions with questions that can be tested, reminding community's rules when necessary and coordinating discussions. Students, on the other hand, collaborated in their groups with the rest groups as well as with each other in order to find the Zeus' thunderbolt in the Archaeological Museum, applying the rules of the learning community and following instructor's guidelines, they expressed their ideas, conducted the experiments, drew conclusions and undertook the division of labor within their groups.

Conclusions

Overall, in the beginning of the educational program, students were not listening to the instructor and they were not respecting the rules. The violation of the rules continued in the course of the program and only in the end students started to be more collaborative with their classmates. The duration of the program is quite short so we cannot conclude with certainty whether students' response to the new way of working would essentially change if the intervention was longer or repeated. It is obvious though that students are not used to work in these settings, which probably makes it hard for them.

If we can consider that students' difficulties in relation to the formation of the concept of air as well as the new way of working indicate the «current social situation of development», this novel way of working in the museum can be seen as the «first form of joint action». In this frame, all educational program's features, such as game-like activities, experiments and problem-solving situations can be considered «cultural means of transformation of social situation of development» according to the experimental-genetic method. That means that students gradually are moving beyond their boundaries by collaborating and following instructions.

According to O. Rubtsova and H. Daniels [13], what makes an intervention successful and leads the participants to positive changes is «the dramatic character of the organized interaction». The two ingredients to achieve the latter are conflict and reflection. The conflicts that emerge by the educational program's activities are on the one hand students' emotional involvement in the incident with Aeolus and Zeus within the storyline and the problem-solving situation (if we don't help Aeolus he may lose his life from Zeus' wrath) while on the other hand, it is the students' confrontation with their own misconceptions about air and their transcendence by doing the experiments and drawing conclusions based on their observations. All the above provokes students' emotional involvement in the course of the educational program and its game-like activities which result in emerging "contradictions, which trigger «pereghivanie» [13]. The reflective evaluation of students applies here in several parts of the program. Every activity of the educational program starts and ends with a discussion during which students have the time to express their ideas about the exhibits, Dodoni, the story, the concept of air, to make connections with their everyday lives, to form hypotheses, communicate their observations, draw conclusions and all of these discussions help them to review their situation of social interaction and reconsider their opinions and points of view [14 as cited in 13]. Another action that helps students to reflect on their experience is making the drawings in activity 6, the role on the wall, where they can revisit their experiences and activities and share with Aeolus their inner thoughts and ideas that will lead him to the solution of his problem.

All in all, the experimental-genetic method seems an appropriate tool of analysis for interventions in the field of science education in early grades and, furthermore, in non-formal education. It can provide useful insights about the learning process of young students and it can be further tested towards a more systematic use in research.

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Образовательная программа «В поисках молнии Зевса»: анализ средствами экспериментально-генетического метода

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В статье описана попытка применения экспериментально-генетического метода Л.С. Выготского в контексте обучения естественнонаучным дисциплинам в школе и в неформальной обстановке музея. Характер курса по естественным наукам в начальной школе, а также необходимость гибкого его выстраивания и включения в него элементов творчества указывают на то, что экспериментально-генетический метод может выступать важным инструментом анализа, позволяющим получить содержательную информацию о процессе обучения. Мы использовали этот метод для анализа данных, полученных в ходе реализации образовательной программы «В поисках молнии Зевса» в Археологическом музее Янины в Греции. В отличие от других, эта образовательная программа вводит научные понятия и приобщает детей к научному методу, одновременно знакомя их с экспозицией музея. В настоящей статье представлен метаанализ реализации программы в 1-м классе государственной школы. Полученные данные ясно свидетельствуют о наличии взаимосвязи между формированием

понятия «воздух» и социальными отношениями и взаимодействиями между школьниками. Выход за рамки ошибочных, житейских представлений о воздухе в процессе проведения экспериментов и попытка приспособиться к новому способу деятельности приводят к целому ряду противоречий, но в то же время оставляют пространство для рефлексии, создавая в совокупности «драматический характер организованного взаимодействия».

Ключевые слова: экспериментально-генетический метод, неформальный, естественнонаучное образование, переживание.

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Methodological Challenges of Studying Children in a Living Laboratory: Case example of Conceptual PlayLab

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Digital technologies have created possibilities in research unavailable when Vygotsky first introduced his cultural-historical approach for studying children's development. More needs to be known about the relations between methodology and method when using digital tools in the early developmental period (1-5 years). In this paper we introduce the concept of a living laboratory to capture the research dynamics of this cultural age period in family homes and preschool settings under conditions of an educational experiment. We discuss Vygotsky's theoretical concepts as foundational for theorising the use of digital tools for researching in a living laboratory. Central for a living laboratory are: (1) capturing development in motion, (2) including the past in the present research context, (3) designing studies in ways that go beyond fossilised complete forms of development, and (4) creating study conditions for condensed and amplified forms of development. To bring these conditions into the research contexts where a condensed form of development emerges opens up a dynamic yet dialectical way of studying early development. We showcase digital tools, such as VR and digital data collection, as part of (1) undertaking an educational experiment of a Conceptual PlayWorld, and (2) a cultural-historical conception of longitudinal research for studying the conceptual development of infants, toddlers and preschoolers within a living laboratory.

Keywords: cultural-historical, method, methodology, early childhood, digital, VR, development.

Introduction

The aim of this paper is to conceptualise the method and methodology of studying in naturalistic settings infants, toddlers and preschoolers' conceptual development. An approach that can create developmental conditions in a *condensed form* can give researchers new directions for studying early conceptual development in naturalistic early childhood settings. Taking insight from Vygotsky's [11] study of the history of the development of higher mental functions, we theorise the developmental dynamic of in-fants and toddlers as part of their everyday experiences in early childhood settings, but under *amplified conditions.*

In this paper we specifically draw upon the methodological principles outlined by Vygotsky, but do so in a context of digital tools not available in Vygotsky's time, and the cultural age period that has received less attention and therefore we suggest is under theorised. We have named the outcomes of our conceptualisation of researching infants, toddlers and preschoolers in condensed and amplified developmental conditions as a *cultural-historical living laboratory.*

Core to the discussions presented in this paper, is determining how a living laboratory can give insights into the dialectical nature of the merging of cultural and biological development of infants, toddlers and preschoolers. The foundations of Vygotsky's cultural-historical conception of development identifies that "the basic uniqueness of child development consists in the merging of cultural and biological processes of development." [11: 23] and this means "the basic problem of research [is] to be the thorough study of the one order and the other and a study of laws of their merging at each age level" [11: 22]. Here lies the methodological problem of studying children in naturalistic settings, and the challenge of finding the methods which can achieve this kind of dialectic study of infants, toddlers and preschoolers.

To achieve the goal of our paper we begin by drawing upon the foundational methodological principles of research outlined by Vygotsky and review these in relation to what is known about studying children in everyday settings. We discuss an educational experiment in the context of the digital methods we have developed in our Conceptual PlayLab (https://www.monash.edu/conceptual-playworld). We conclude by theorizing a living laboratory of condensed and applied developmental conditions captured digitally in the study of infants, toddlers and preschoolers' conceptual development.

Cultural-historical principles of studying development

To theorise how to study the development of infants, toddlers and preschoolers, as is the focus of this paper, a close interplay between methodology and method is needed. First, with the backdrop of the biological development of the child, it can be argued that there is no uniform or even universal conception of cultural development. By its very nature, the development of the child will always be in relation to the societal values, the institutional contexts and conditions that realise these values, and the personal orientation of the child who enters into, is shaped by, and who shapes their cultural conditions [5]. This dynamic is complex, and is in constant motion [11]. It brings its own unique challenges to researchers interested in studying young children's development in naturalistic settings. This means researchers need methods that will capture the dynamics of societal values and institutional practices in relation to the child's emerging developmental trajectory.

Second, cultural development in contemporary settings, such as family homes and early childhood settings, is also located historically. Many practices and beliefs surrounding children's development have formed in relation to societal needs at different historical times, and researchers can become blind to these. For instance,

... the timing of one or another stage or form of development to certain points of organic maturity, occurred over centuries and millennia and led to such a fusion of the one process and the other that child psychology stopped differentiating the one process from the other and became convinced that mastery of cultural forms of

behavior is just a natural a symptom of organic maturity of any bodily trait. [11: 23].

This is not history as facts about past events, as is the everyday reading. To understand how the past is located in the present in naturalistic settings requires researchers to look for evidence of the existence of the ideal forms of cultural development [10] that are there from the beginning for a child, and how these ideal forms act as developmental conditions that have become valued within the particular communities in which the research is being undertaken. Vygotsky argued that the "historical study of behavior is not supplementary or auxiliary to theoretical study, but is a basis of the latter" [11: 43]. This means researchers need to pay close attention to cultural development of the past located in the present, not as a self-evident biological trait of the infant/toddler/preschooler, but rather as the pull of cultural practice realising cultural (and not biological) development of the child.

Third, Vygotsky argued that a great deal of research was performed as a postmortem of already developed children. He suggested that the orientation in this research was to study the product of development and not the process of development. He recognised that researchers needed to,

encompass in research the process of development of some thing in all its phases and changes-from the moment of its appearance to its death-means to reveal its nature, to know its essence, for only in movement does the body exhibit that it is. [11: 43].

In bringing together the historical with the cultural, it becomes evident that cultural-historical research seeks to, "study something historically [and this] means to study it in motion" [11: 43]. This is not a linear process, but it is a dialectical relation between the biological and the cultural forms of development that merge at different periods within the life course of a human being. In contrast, and in drawing on a metaphor from geology, Vygotsky [11] argued that many researchers study what has already formed:

Our psychological fossils show, in a petrified and arrested form, their internal development. The beginning and end of development is united in them. They actually are outside the process of development. Their own development is finished. ...making them incomparable material for study. [11: 44].

To capture in motion the dialectical unit of cultural and biological development with the different merging points over time, means that researchers need innovative tools and well theorised methods for undertaking this kind of research in naturalistic settings (discussed further below).

Fourth, different to some study frames, is that the *process* of the research and the *development* of a motive orientation are viewed as important as the *end result* of the research [11]. Captured as a revolutionary, rather than evolutionary conception of children's development, Vygotsky [12] presented periods of development in relation to the motive orientation of the child, and transitions between these are evidenced as a change in motives. Conceptualised as the cultural age of the child, research-

ing children's development brings forward the societal values, institutional practices, the social situation and the child's social situation of development. But to study the life course of developmental conditions of a child within a particular society demands an approach that represents in condensed form children's development.

Although more theoretical points are evident across the 6 volumes of the Collected Works, it is beyond the scope of the word limitation of this journal to present all. However, the 4 methodological points discussed in this section foreground method challenges that researchers need to pay attention to when studying infants, toddlers and preschoolers in a living laboratory. Therefore, central for our conception of a living laboratory is capturing children's development,

1. in motion
2. where the past has its traces in the present
3. beyond fossilised complete forms
4. in a condensed and amplified form

Therefore, to study the merging of cultural and biological processes of development in relation to the *cultural age* of infants, toddlers and preschoolers in the living laboratory needs particular conditions. To bring these conditions into the research context in a condensed form opens up a dynamic yet dialectical way of studying infants, toddlers and preschoolers' development of imagination in play as foundational for concept formation. But to achieve this goal, we introduce an educational experiment as a positive force for creating these conditions in a condensed form.

A condensed form of development: An educational experiment

Setting up developmental conditions in research has always been a challenge for researchers. One of the important conceptualisations introduced by Vygotsky [11] in his cultural-historical writings on development has been the idea of setting up research conditions which capture the developmental conditions of children. First, the "greatest difficulty in genetic analysis consists precisely in using experimentally elicited and artificially organized processes of behavior to penetrate into how the real, natural process of development occurs" [11: 94]. Second, Vygotsky [11] suggested that, when researchers set up experimental conditions away from real life, that this creates "...the enormous problem of transferring the experimental outline [method] to real life always opens up before genetic research" [11: 94]. How do researchers design experimental research methods that can be fitted into the everyday life of teachers, children and their families? Third, when researchers transpose into everyday life situations an experimental method that works in a laboratory, can we feel confident about the results? Vygotsky wondered,

"If the experiment discloses for us a sequence of patterns or any specific type, we can never be limited by this and must ask ourselves how the process being studied occurs under conditions of actual real life, what replaces the hand of the experimenter who deliberately evoked the process in the laboratory". [11: 94].

As a result of these challenges, researchers have looked to naturalistic settings and conceptualised their methods in relation to undertaking research in everyday life. That is, naturalistic studies have tended to follow the activities of teachers, children and their families as they participate in institutional practices, community activities, and study how development arises in everyday life in their society [6]. However, this presents its own challenges. Rather than waiting in everyday life for development to unfold as part of a naturalistic study of children's development, Vygotsky suggested that it was possible to research development in ways that deals with the problems of experimental research, at the same time as overcoming the problem of spending long periods in the field studying developmental conditions as they arise. His advice was to create research conditions in which the development of children was amplified in intensity and condensed in time and place. Thereby giving research conditions of development in a condensed form. In our Conceptual PlayLab we have been aware of these methodological challenges and have sought methods that have overcome these problems. In particular, we have drawn upon and taken forward, the method of an educational experiment.

An educational experiment [4] in the living laboratory of an early childhood setting is an extended collaboration between the participants and the researchers. An educational experiment is conceptualised as a dialectical study [4] because the process creates conditions that help researchers to identify through research, children's development, whilst also making visible how these conditions are planned and implemented. It is not a problem of practice, but rather it is a theoretical problem that is studied. In our case, to study how to research the cultural age period of infants, toddlers and preschoolers within early childhood settings as they develop their imagination as foundational for concept formation.

Davydov's educational teaching experiment in schools is one such approach for creating developmental conditions of children in secondary schools [1]. Hedegaard's [4] educational experiment in schools was formulated based on Davydov's theoretical-dialectical knowledge but expanded in relation to:

• Theoretical principles behind the educational experiment
• Teacher's program
• Children's activities and how they contribute to the child's motive orientation
• Appropriation of knowledge and thinking strategies

Conceptualised as a double move of planned activities and children's activities, Hedegaard was interested to study how school discipline content knowledge in primary schools becomes personally meaningful to children. She wrote:

The teaching activity must consider children's engagement with each other and the demands of solving tasks together; it should also ensure that the tasks draw on the children's everyday knowledge and interest, and promote shared engagement. The teaching activities should seek to combine these elements with the educa-

tional goals and subject matter knowledge in ways that transform and combine children's everyday knowledge *and goals with their motives and interests, into new motives.* [4: 188, our emphasis].

Significantly, the leading motive of the primary school child is learning yet our central problem is in relation to studying infants, toddlers and preschoolers, where imagination is the developing motive orientation [12]. Consequently, we looked to Lindqvist [7] who also drew on Davydov's teaching experiment, Hedegaard's educational experiment, and importantly Vygotsky's method of a double stimulation when studying 3 to 5-year-olds in playworlds. In line with Vygotsky [11], Lindqvist was interested in the cultural development of the preschool child, rather than studying biological maturity. She defined it as, "a form of action or intervention research, where everyday situations are systematically intervened, and an educational perspective is combined with a research perspective" [7: 67]. She introduced a playworld intervention into practice to study the aesthetical development of the preschool child within the practices of play.

Lindqvist's [7] methodology for researching young children in a common playworld and Hedegaard's [4] conception of a double move are contemporary examples of an educational experiment for the study of young children. Lindqvist's [7] research focused primarily on play as the leading activity, but unlike Hedegaard [4] she did not examine the development of discipline concepts. Rather she was interested to study the development of children's play through drama pedagogy. Both Lindqvist's [7] and Hedegaard's [4] conception of an educational experiment inspired us with developing methods and a methodology for researching in a living laboratory infants, toddlers and preschoolers' development of imagination as foundational for concept formation. But infants, toddlers and preschoolers' leading motive is for the development of imagination [12] in play [9] and an educational experiment as yet, has not been theorised in relation to this motive orientation. How an educational experiment can create developmental conditions in a *condensed form for the infant/toddler/preschooler cultural age period* has not yet been undertaken.

Davydov and Hedegaard captured the developmental practices and activities of the children through observations, and Lindqvist used videotape recordings of planned dramatizations and organised play sequences, in addition to journal documentation and discussions with children and teachers. In our educational experiment the latter could not capture the development of infants, toddlers and preschoolers. As such, new methods needed to be developed as part of our educational experiment.

Core to our educational experiment was capturing the ongoing practices of the teachers in social relations with the infants, toddlers and preschoolers as concepts become personally meaningful in imaginary situations. In our research, special attention was placed on how this takes place within a living laboratory where we created the conditions for a condensed form of development of imagination as foundational for concept formation. We now give a brief overview of the educational experiment

we employed to amplify the conditions for conceptual development in imaginary situations of infants and toddlers.

Condensed form of development for infants and toddlers: A Conceptual PlayWorld as an educational experiment

In our educational experiment, a *Conceptual PlayWorld* creates developmental conditions in condensed form, amplifying infants, toddlers and preschoolers' imagining and conceptual development. A *Conceptual PlayWorld* is a play-based model of practice inspired by a story. The five characteristics of a *Conceptual PlayWorld* were conceptualised in relation to Vygotsky's [12] conception of development, and are summarised as follows:

1. *Selecting a story for the imaginary play:* the story has to be dramatic with emerging tensions and crisis in the plot, relevant to the children's cultural age and their interest and experiences, and both enjoyable for both the children and the teachers (e.g. How to move a possum out of a house?).

2. *Designing the imaginary spaces:* the children along with the teachers design the space, indoors or/and outdoors where their imaginary play is developed. The physical space is extended and expanded through children's play (e.g. a tent can have the new meaning of a possum's nest).

3. Entering and exiting the imaginary situation: being in role, children and the teacher are the characters of the imaginary situation (e.g. a baby possum, a mummy possum or an aunty possum).

4. *Planning a problem to be solved:* in search of the resolution key in the drama of the story, children form and use concepts in order to provide answers to the problematic situations that the characters are experiencing (e.g. identifying the footprints of a possum to follow her trace- focus on the external biological characteristics of a possum).

5. *Planning the role the teacher will take in the imaginary play:* teachers plan their role to be equally present with the children, or to model practices in role, or to be needing help from the children in line with the cultural as well as the biological aspects of the children development (e.g. the teacher in the role of the wise grandma possum).

The *Conceptual PlayWorld* model creates developmental conditions in condensed forms amplifying infants, toddlers and preschoolers' imagining and conceptual development. Within the educational experiment of a *Conceptual PlayWorld* quality learning challenges, opportunities and possibilities emerge that allow the social and cultural development of imagination, as a higher mental function, in dynamic relation with the formation of concepts. Within this amplified pedagogical framework, young children enter into and participate in the group activity setting sharing the learning experience with the teacher and their peers as a team. Imitation, interactions, body positioning, gesturing, the use of means, tools and objects, the exploitation of a wide range of props and artefacts are criti-

cal in the *Conceptual PlayWorld* activity setting. Being in the imaginary situations children face the demands of the activity settings as well as put new demands on the activity setting. The child shapes the *Conceptual PlayWorld* in the same way the *Conceptual PlayWorld* shapes the child's experience.

To support our educational experiment of a *Conceptual PlayWorld* we designed an app (Figure 1) for researchers so that they could capture in digital form moments of imagining in play and imaging in science, as was the focus of our research of infant and toddler development. The digital video recording could be captured on the app, so that teachers and researchers working in collaboration could document imagination in play and imagination in science moments. This gives the possibilities to capture the ideal form of infants/toddlers/preschoolers/school age children development "in the moment". Long video segments or continuous 30 second video recordings are possible through the tool. This can also be achieved in selfie mode if the teacher is working on their own. By capturing in the moment and ongoing video recordings of the educational experiment in action, data are collected that

show the developmental conditions and outcomes acting together.

But to support our educational experiment, the app also held videos of each of the 5 characteristics of the Conceptual PlayWorld (Figure 2). This meant the educational experiment included opportunities for viewing examples of the developmental conditions in condensed form where the activity setting and the new practice tradition of the institutions for imagination in play and imagination in Science, Technology, Engineering and Mathematics (STEM)were available.

Alongside of the use of the app, we also used 2 digital video cameras (see Tables 1—4 further below) to digitally record the educational experiment during the process of development, where it was also possible to study how the conditions of the intervention itself changed the educational experiment, as noted by Vygotsky and Luria "we were studying one and the same activity each time in its new concrete expressions, but that, over a series of experiments, the object of research changed" [13: 114], because the conditions and the children's growing competences were always in the process of development.

Fig. 1. App designed to capture in everyday practices the real form of development of children
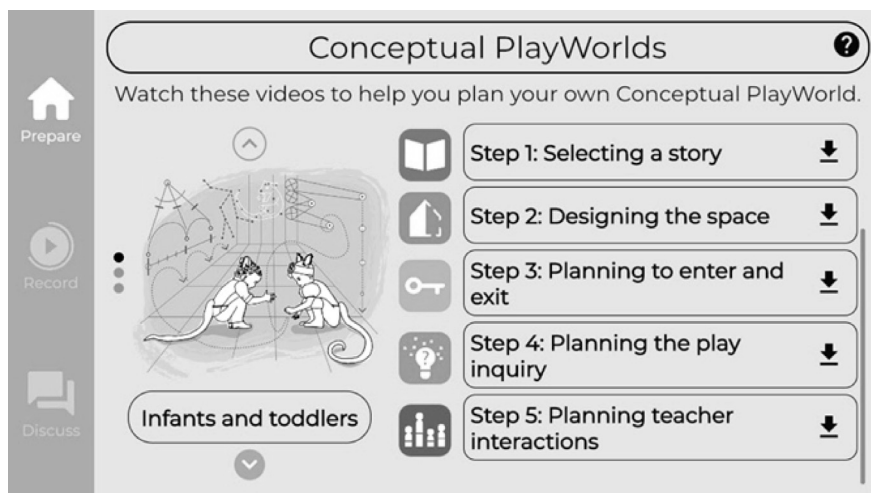

Fig. 2. App for introducing an ideal form of development in a Conceptual PlayWorld

Educational Experiment to amplify Children's STEM Concept Formation in Family Settings

The prefix 'educational' in an educational experiment has been used as a deliberate attempt to emphasise that the purpose of intervention in an experiment is not to capture objective reality in the best possible manner but rather to offer opportunity for participants' subjectivity and perspective to create the transformative practices that ensure their wellbeing. It is from this perspective 'Conceptual PlayWorld for families' model was designed. It would be worth arguing that the prime focus of Vygotsky, Leontiev, Luria and Davydov's work was not merely understanding development or learning as a conscious process but also as a purposeful, meaning-making and educational practice. This idea is important to understand educational experiment as transformative practice and not merely as studying the functioning of the conscious mind. Seen from this lens, educational experiment as a methodology is not just an intervention in a given setting but rather an effort to transform existing ways of learning and developing for children. Hedegaard [4] argues that "the educational experiment is a multi-faceted planned preparation of teaching which has, as its goal, the creation of optimal conditions for the learning and development of the participating children" [4: 185]. As a methodological approach for intervention in the family homes Conceptual PlayWorld follows principles of double move as delineated by Hedegaard [2; 3] Conceptual PlayWorld for families is a planned intervention that is jointly developed by parents/caregivers and researchers. Children's play and storytelling which are part of their everyday life are used as a collective space for joint problem solving or exploration. These explorations in a Conceptual PlayWorld are theoretically guided by the understanding of how children learn and also by the STEM concepts employed in sustaining children's curiosity. Instead of a traditional experimental approach where authority of the researcher is supreme, educational experiment values participant's agency in creation of transformative practice. Thus the effort as Hedegaard [4] remarks, in an educational experiment helps children to "formulate their own models which create connections between theoretical concepts and specific events". [2: 187].

We are presenting here a snippet of data to argue how principles of double move presented by Hedegaard [3; 4] were used in the context of "Conceptual PlayWorld for Families" (CPWf) in creating a motivating condition for children's concept formation. Furthermore, an argument is being made for using visual data and digital tools in recording and analysing children's concept formation. The following four characteristics define how this CPWf was created in collaboration with the families:

Using group/collective activity as central to developing a problem scenario: Instead of focusing on the individual child the educational experiment was designed with an expectation to engage the entire family. It is envisaged that this collaborative activity setting, largely created by the adult would create the possibility for children to explore the problem scenario collectively. The CPWf model makes two broad suggestions in this regard: one it encourages parents to take different roles alongside the child/ren. One of the parents could be just above the child's existing understanding and keep asking questions or making suggestions from the child's perspective, the other adult could take a role of offering new concepts or further explorations. This careful planning to design a collective activity as suggested in the Characteristic 4 and 5 of the Conceptual PlayWorld model helps families to stretch their children's thinking. The image below (Figure 3) shows parents working together to create a problem scenario.

(2) Opportunities for children to explore and formulate their own 'modes of action': The problem scenario is designed with a purpose that children would feel empathy with the character. This empathy or affective engagement would help children to be agentic in shaping their activity setting. Therefore, an educational experiment challenges the binary of researcher and the re-

Fig. 3. Shows parents working with a child in creating a collective problem scenario

searched participants. Often in traditional experimental settings children are merely researched. Thus, children are not responding to the stimulus being presented by the researcher rather creating their own developmental conditions for learning. In one of our resource production projects conducted in the home setting the four-year-old child designed her own mini-game to explore the concept further. In this case, children's story book Rosie's walk was used to set up a problem scenario where Rosie's (the hen) friend plans to come to her house and Rosie had to design a map so that her friend could come and visit her. While working on this problem the child designed a game of 'Robot's walk'. There were three participants: father, daughter and her doll 'Hiya'. The father had to be Hiya's robot and search for Hiya's doll which was lost. Hiya is in her car which was pulled by the child using a string. The father can't move or touch Hiya's car. Thus, the father was giving directions to the child to move in different rooms as they were searching for Hiya's doll. This example highlights the possibility for children's own intentional action to become part of an educational experiment. The image below (Figure 4) shows the child's exploration in the game of designing the map for the 'Robot's walk'.

(3) Digital tools in supporting children's active exploration and development of their motives: Central to this educational experiment model has been developing a transformative practice that can support children's exploration. In the specific example mentioned above the parents also used digital tools (iPad) for showing how google map app functions if the child has to go from her home to school. The ideal form [10] of practice helped the child to explore her curiosity further as she wanted to use the iPad later to search for different places. Digital tools thus acted as an auxiliary means to enhance children's exploration [8].

(4) Development of thinking and concepts: In a CPWf the effort is not to draw a one-to-one correspondence between stimuli and children's action. It would also be worth arguing here that concept formation would not be a one-shot process. In this context the educational experiment follows children's engagement in Conceptual PlayWorld over an extended period of time. Vygotsky [11] highlighted that the mechanistic

and structural understanding of mental processes is one of the central challenges with the experimental methods. He remarked that,

We are intentionally simplifying the matter in order to isolate the most essential characteristic of the experimental method in psychology. It is understood that actually the matter is much more complex. Not one stimulus, but a whole series of stimuli, sometimes complexly constructed groups of stimuli and, corresponding to this, not one response, but a long chain of responses or their complex combinations characterize an experiment. [11: 31].

In the context of Conceptual PlayWorld, children's imagination is the central object of inquiry but it also takes into consideration a number of bordering and auxiliary concepts e.g. child's agency, logical thinking, tool-mediated action to explain children's concept formation. Thus, the effort is to move away from the stimulus response relationship to a wholeness approach that analyses children's social situation of development to understand their learning and development.

A living laboratory: Educational experiment over time

Our living laboratory and approach comes in line with the fundamentals of a cultural-historical standpoint and positioning in empirical research: (a) capturing processes in motion, (b) recognizing past in the present, and (c) focusing beyond fossilized complete forms. We present another case example in this section to illustrate how data in our living laboratory is formed over time. We foreground a systemic, holistic, and in motion methodological approach to the collection of qualitative empirical data that can capture the uniqueness of the child's development as well as the complexity of the early childhood educational reality. Paying attention to this dynamics and interrelations of child and environment is foundational to our living laboratory.

Four forms of data generation and data collection practices are presented: (a) tracing across different cultural age periods, (b) mapping of personal pathways, (c) tracking across diverse educational realities, and (d) shaping practice with the teachers. The suggested forms are illus-

Fig. 4. Image showing child's engagement with drawing a map for Rosie's friend

trated in the following tables (Tables 1, 2, 3 & 4) in regard to the methods and tools used as well as with the theorization that lies behind each methodological choice.

The forms come in line with a digital orientation of data gathering and analysis discussed above. The following scheme of digital data gathering practices exploits a wide range of visual tools such as digital cameras and software applications to allow illustrative practices of analysis of the generated and collected data. The use of digital tools creates a corpus of data where the dynamics of authentic children's experience can be unpacked. In this framework, the processes of becoming can be mapped, qualities such as expressions, gestures, body positioning, sounds are captured, the transformations of the context become visible, and layers of dialectic interrelations between the personality and the environment unfold. These illustrative practices build through a deep and extensive engagement of the researcher with the research data.

Across the three cultural age periods: infants, toddlers, and preschoolers

Following a cultural-historical research methodology, the child's learning and development is studied and captured as a real-life phenomenon within the child's everyday educational reality in the early childhood settings. Table 1 illustrates how a variety of the activity settings of *Conceptual PlayWords* are digitally documented (Column 4) across different classrooms with children being in different cultural aged periods (Column 1). The educational experiment (Column 3) of the *Conceptual PlayWorld* amplified the development of imagination as well as a wide range of STEM concepts formation (Column 2). Being with the *Conceptual PlayWorld* children developed diverse and advanced forms of imagining such as imagining led by the child, joint imagining and collective imagining. They also used their imagination as a means to develop a motive orientation to the collective, to share an intellectual and abstract space as well as to join, contribute and shape the group activity. Children formed STEM concepts such as the biological characteristics of a possum (Figure 1), the design process of building a possum habitat (Figure 2), the possum as part of the ecosystem (Figure 3) while playing within imaginary situations with the early childhood teachers being in role too (Column 2). The way a child enters into and participates in an activity setting, the intentions and demands she/he makes on the activity settings and the demands made on the child as well as the practice traditions within the center are also documented (Column 5).

Using the concept of *cultural age periods* gives us a different way of conceptualising the research process over time. By following infants as they become toddlers, and then preschoolers as presented in Table 1, we argue that this is more than a longitudinal study. In our theorisation we do not just focus on the child, but study the interrelations of child and environment over time. This gives different possibilities in research where a common amplified developmental practice of a *Conceptual PlayWorld* is used in subsequent years with the same children, as we now present in the section that follows.

Personal pathways: the transitions between the cultural are periods

Following a developmental research methodology, transitions have a critical role in understanding the child's development. Table 2 illustrates a case example of one child participating in the activity settings of a

T a b l e 1

Across the three cultural age periods: infants, toddlers, and preschoolers

Cultural age	Digital Vignette	Methods	Tools	Theorization
Infants	Figure 1	— Educational experiment as an intervention within everyday educational reality in the early childcare centers	— Digital video cameras (e.g. GoPro camera, 360 camera, wearable cameras) used by the research team to capture the whole activity setting in the processes of becoming including qualities such as expressions, gestures, body positioning, sounds and implicitly or explicitly expressed motives, intentions, demands, practice traditions	— Vygotsky [11]: learning and development within everyday experiences under amplified conditions
Toddlers	Figure 2			— Hedegaard [4]: a dialectical framework that creates condensed conditions that help researchers to identify through research children's development
Preschoolers	Figure 3		— Application: Fleer's Conceptual PlayWorld Research tool (https://www.monash.edu/conceptual-playworld/app) used by the ECT to capture authentic children's experiences and spontaneous moments of children's engagement with the CPW	— Lindqvist [7]: playworlds as a space for systematic interventions within everyday situations; educational and research perspective as a unit

Conceptual PlayWorld as an infant and then, a year after, participating in a different *Conceptual PlayWorld* as a toddler (Column 1). The set of vignettes (Column 2) is indicative of the way the child's imagination is developed as the teacher introduces the ideal form of imagining to the infant (Figure 1) and then the child, as a toddler, can lead the imaginary situation independently (Figure 2). This framework allows us to follow and study children over time (Columns 3 & 4) as they make transitions between cultural age periods, as they move through social situations, and as they select, shape and transform their personal pathways (Column 5). What is important here is that the personal pathways are conceptualized and mapped not as individualistic trajectories but as a transformation, an ongoing qualitative change of group relations, as the child develops in a dialectic interrelation with his/her environment.

The use of the concept of *developmental pathways* allows us to focus on what is unique for each child and capture the nature and the qualities of her/his development in relations to the opportunities and the possibilities that emerge within the *Conceptual PlayWorlds*. Following focused children through their transitions between different cultural age periods and through participating in diverse *Conceptual PlayWorlds* as illustrated in Table 2, we argue that a new cultural-historical framing in the notion of the longitudinal study is introduced. Going beyond repeated observations and stable variables, we do not aim to focus on the continuum of the gathered data. Our focus is on closely capturing the qualitative changes and transformations in a child's learning and development trajectory in dialectical relation to the social and cultural reality of the child within the *Conceptual PlayWorld*. That differs from longitudinal studies that aim to explore either cultural or social changes over time. The several ideal developmental pathways that *Conceptual PlayWorlds* make available to the child and the child's positioning towards these pathways become visible. Getting an insight into diverse trajectories of children from diverse early childhood centers allows us to highlight the catalytic role of the environment in children's development as presented in the following section.

Across diverse early childhood settings

From a cultural-historical methodological standpoint what is also important is to capture how the conditions for children's learning and development also differ across diverse institutional settings. The table presented below (Table 3) illustrates how the educational experiment of a *Conceptual PlayWorld* travels across diverse early childhood centers (Column 1). Different early childhood educators created unique developmental conditions to support each child's concept formation within diverse *Conceptual PlayWords* (Column 3). A wide range of quality learning experiences and opportunities for development emerged tailored to the children's needs in each classroom and in each center (Figures 1, 2, 3 & 4). The variety of institutional practices and the societal values that these practices reflect were highlighted and documented though the available visual tools (Columns 4 & 5).

Focusing on diverse institutional practices and practice traditions across different early childhood centers or within the same setting the study showcases how different contexts can create diverse and unique conditions for development. As shown in Table 3, a range of centers participate in the study. This allows us to delve into diverse educational realities, to understand how societal values are interpreted in different frameworks, how institutional contexts and practice traditions are formed, what are the important factors that shape and reshape a quality learning environment, and importantly, how the child orients herself/ himself within this environment and how she/he is shaped and shape this environment. The added value of the across settings observations is that it leads to a broader as well as a more accurate understanding of the educational reality oriented by the context but not limited by it.

Shaping practice with the teachers
Within this framework, the role of the early childhood teachers and their perspective in research are critical. In Table 4 are illustrated several forms of collaboration between teachers and researchers (Columns 1 & 2) such as everyday introductory professional development sessions

T a b l e 2

Personal pathways: the transitions between the cultural age periods

Cultural age	Vignette	Methods	Tools	Theorization
Infant	Figure 1	— Educational experiment as an intervention over time as part of a longitudinal study	— Digital video cameras (e.g. GoPro camera, 360 camera, wearable cameras) used by the research team to capture the transformations of the context, & the dialectic interrelations between the child and the environment over time	— Vygotsky [11]: development as a process, in motion — Vygotsky [12]: double stimulation and auxiliary means
Toddler	Figure 2		— Application: Fleer's Conceptual PlayWorld Research tool (https://www.monash.edu/conceptual-playworld/app) used by the ECTs to document the flow of educational reality in the centers over time	— Hedegaard [4]: several ideal developmental pathways dialectically related to the social and cultural reality of the child

T a b l e 3

Across diverse early childhood settings

Settings	Vignette	Methods	Tools	Theorization
Center A	 Figure 1	— Educational experiment as an intervention — Across center collaboration through joint planning sessions	— Digital video cameras (e.g. GoPro camera, 360˚ camera, wearable cameras) used by the research team to capture diverse educational realities across different settings — Application: Fleer's Conceptual PlayWorld Research tool (https://www.monash.edu/conceptual-playworld/app) used by the ECTs to document and reflect on their practice	— Hedegaard [4]: diverse institutional practices and practice traditions across different institutional settings or within the same institution — Hedegaard [5]: societal values, institutional contexts and conditions that realise these values, and the personal orientation of the child who enters into, is shaped by, and who shapes their cultural conditions
Center B	 Figure 2			
Center C	 Figure 3			
Center D	 Figure 4			

(Figure 1), interactions and reflections (Figure 2) as well as ongoing support through consultancy and collaborative planning (Figure 3 & 4), and follow up meetings (Figure 5) and how the overall collaboration is documented (Column 4). The extended collaboration between early childhood teachers and researchers (Column 3) is beneficial in a twofold way. Firstly, it allows both parts to contribute to a continuous quality improvement planning based on each part's strengths. Secondly, capturing through diverse ways the teachers' perspective adds to the illustrative practices by giving the inside story of the everyday educational routine. This framework allows research to go beyond the level of adding academic knowledge to the level of shaping practice and transforming educational reality in the process of development (Column 5).
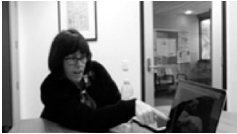
Using Vygotsky's and Hedegaard's conceptualizations of the role of the researcher, we include the researcher in the implementation of the study design. Like Hedegaard, we argue that this is not a problem of practice as in action research for example, but it is a theoretical problem. Researching through an educational experiment is a theoretical problem of development since a condensed form of development has to be thoughtfully designed, strongly supported and adequately studied. The resolution key to this theoretical problem comes from the collaboration between the research team and the early childhood teachers. The amplified conditions are designed collaboratively with the early childhood teachers in the centers who have skills to amplify learning and development through play and imagination within the *Conceptual PlayWorlds.* Going beyond the limitation of an intervention within existing contexts, the *Conceptual PlayWorlds* educational experience emphasizes on the transformative practices that reconstructing and enriches the existing learning and development conditions creating opportunities that advance and improve educational reality.

Taken together (Tables 1—4), the above dialectical model of research practices allow us a deep insight within the process of a child's development and the educational practice as a real life and an everyday phenomenon. Within this living laboratory, children's participation in research is consciously realized and understood as the research procedure occurs with the children rather than on the children. At the same time, teachers' participation in research is positioned within a collaborative and supportive environment that aims to shape practice, advance teachers' confidence and competence and create new ways of activity rather than document and interpret the existing forms of activities.

T a b l e 4

Collaboration with the teachers

Forms of Collaboration	Vignette	Methods	Tools	Theorization
Introductory PD sessions	Figure 1	— Educational experiment as an ongoing collaboration between teachers & the research team — Informal discussions between the teacher & the research team during the everyday educational reality — Focus group sessions — Stimulated recall interviews	— Digital video cameras used by the research team to capture the ECTs reflexions on the process over time — Digital meetings that build through a deep and extensive engagement of the researcher with the research data	— Hedegaard [6]: a double move of planned activities and children's activities; extended collaboration between ECT and the research team — Vygotsky and Luria [13]: studying CPWs as one and the same activity each time in its new concrete expressions, as the object of research is changing over time because the conditions & children's needs andinterests are always in the process of development
Interactions during everyday educational reality	Figure 2			
Consultancy during planning sessions (in person and remotely)	Figure 3 Figure 4			
Follow up discussions	Figure 5			

Conclusion

The examples from the home settings and early care centres presented here makes an attempt to employ our previously theorised discussions on the principles of a cultural-historical methodology (in the introduction section) to develop a living laboratory that uses digital tools both to record data but also to amplify children's experiences of learning. Vygotsky [12] argued for psychology to move from "a purely descriptive, empirical, and phenomenological study of phenomena to disclosing their internal essence" [12: 189]. This challenge of 'disclosing the internal essence' demands a methodological approach that could move beyond the concrete and obvious. This paper reports two case examples where Conceptual PlayWorld has been used as an intervention to design possibilities for children's STEM concept formation in home and early care settings. This is modelled on Hedegaard's [6] formulation of educational experi-

ment. Following Vygotsky's advice of going beyond a mechanistic relationship between variables the effort in the living laboratory designed for this intervention is to understand the higher mental functioning in all its complexity. As Vygotsky argued the study focuses "not on one stimulus, but a whole series of stimuli, sometimes complexly constructed groups of stimuli and, corresponding to this, not one response, but a long chain of responses or their complex combinations [that] characterize an experiment." [11: 31]. Extending these arguments to understand children's concept formation the Conceptual PlayWorld as an intervention creates a condensed and amplified experience for children and their caregivers and teachers where the object of inquiry is seen:

1. in-motion
2. beyond fossilised complete forms
3. the past in the present, and
4. where the researcher has a central role in developing practice in collaboration with teachers/families,

opening up research into child's development as is reflective of the living laboratory.

In our first example the living laboratory is shown through an educational experiment of a conceptual PlayWorld in the family home. This followed by showing how an educational experiment of a Conceptual PlayWorld in a childcare setting. Together they illustrate how a cultural-historical methodology frames the methods of researching the development of very young children using digital tools captured as a living laboratory.

Vygotsky's time did not have digital tools — therefore in contemporary contexts where these tools are being used, it was important to theorise how we used these methods for allowing:

1. Development in condensed form
2. Amplification of conceptual development

Digital tools in this context were used as auxiliary means that helped to trace the psychological structures and complexes that underlie development of higher mental functions like imagination or problem solving. Thus, living laboratories present a dialectical model of data collection and more importantly shape transformative practice for children's concept formation in contexts of the researcher and collaborators within the study design.

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Методологические проблемы изучения детского развития в «живой» лаборатории на примере Лаборатории понятийной игры

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Цифровые технологии открывают для исследователей возможности, которых не существовало во времена, когда Выготский разрабатывал свой культурно-исторический подход к изучению детского развития. Необходимо лучше понимать, как устроена взаимосвязь методологии и метода при использовании цифровых инструментов в изучении раннего (1—5 лет) периода в развитии детей. В настоящей

статье представлена концепция «живой» лаборатории, которая позволила бы исследовать динамику данного культурного возрастного периода в домашней обстановке или в детских дошкольных учреждениях в рамках формирующего эксперимента. Мы рассматриваем теоретические положения Выготского как обоснование для использования цифровых инструментов исследования в «живой» лаборатории. Ключевыми моментами для лаборатории являются: 1) охват развития в движении; 2) включение прошлого в текущий контекст исследования; 3) проектирование исследований, выходящих за рамки застывших, завершенных форм развития; 4) создание условий для изучения свернутых, интенсифицированных видов развития. Конструирование исследовательских контекстов, удовлетворяющих данным условиям и позволяющих сжатым формам развития раскрыться, представляет собой динамичный и в то же время диалектический способ изучения раннего развития. В статье мы рассматриваем цифровые инструменты (такие как видеосъемка и сбор цифровых данных), во-первых, как часть формирующего эксперимента «Мир понятийной игры» (Conceptual PlayWorld), а во-вторых, как элемент культурно-исторической концепции лонгитюдного исследования развития понятий у младенцев и детей раннего и дошкольного возраста в формате «живой» лаборатории.

Ключевые слова: культурно-исторический, метод, методология, раннее детство, цифровой, видеосъемка, развитие.

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Modern Problems of Children's Play: Cultural-Historical Context

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The purpose of this article is to analyze the state of modern research on children's play, approaches to its study, as well as existing methods of its evaluation. The relevance of the topic is due to the leading role of the play in preschool childhood and the complexity of this phenomenon. Play is actively studied, and play interventions are often used. However, the analysis of the literature shows confusion and uncertainty of terminology due to a large spread of theoretical positions and methodological approaches to the study of play. This creates great difficulties in planning and conducting research, and affects their results. The article deals with the issues of defining and classifying play, understanding its structure and development. The main trends of modern research and their connection with classical game theories, the role of cultural-historical approach and the contribution of E.O. Smirnova to the study of play are shown.

Keywords: preschool, children's play, pretend play, development of play, structure of play, play theory, cultural-historical approach, playful learning, methods of play evaluation.

Introduction

Dedicated to the memory of E.O. Smirnova

Scientific interest in play is more than one hundred and fifty years old. However, both recently and decades ago, authors are forced to state that play is notoriously difficult to define, always "escaping" from researchers [18; 27; 29; 35; 44; 50; 55; 62]. The variety of forms, types, and hypostases of play is too vast.

The majority of modern authors approach the problem of play definition from the point of view of revealing and describing every specific feature of play (criterion-based definition). Thus, play is most often defined as being voluntary, internally motivated, process-oriented rather than result-based, spontaneous, joyous and pleasant, active involvement with an occasional element of make-believe [21; 35; 44; 62]. Other authors [46; 51], based on L. Wittgenstein's philosophical concept of "family resemblances", suggest studying play without defining what play is or what it should be.

Despite its clearly ambiguous terminology, play is being actively studied — both in terms of theoretical conceptualization and in terms of collecting more and more new empirical data. At the same time, serious methodological problems are pointed out in empirical studies of play [13; 19; 35; 55; 58]. It is not always clear which aspect of play was in focus and why is it that different types and components of play are measured in many unrelated ways. The very methods of play evaluation are developed within the

framework of different theoretical approaches to its understanding, and accordingly, the attention of researchers is focused on different aspects of play, and they use different approaches to interpret its outcomes. That is why the mechanisms of play influence on development remain unclear and the chances for reproducing successful interventions are limited [55; 58]. In this regard, highly relevant is the analytical review of psychological papers that would highlight key contemporary problems of children's play: approaches in defining, classifying, understanding the structure and development of play, the methodology of contemporary research, and methods it uses to assess play. Moreover, this analysis is important from a historical perspective, since classical game theories and child development and particularly the cultural-historical approach, continue to guide contemporary research in this field on a grand scale. No such overview is currently available in the Russian or foreign literature.

Classic theories of play

For more than one hundred years, researchers of play have been trying to define the role of play in children's development which they see as an important factor in a child's emotional, social and cognitive development.

Table 1 summarizes some of the basic play theories in a historical perspective.

In the first half of the 20th century, two traditions began to develop that define the theoretical foundations of most modern play research. One of them is based on the theory of J. Piaget, who considers play in the context of cognitive development. Symbolic play is a form of assimilation; it interferes with accommodation and is a maladaptive process that children grow out of with time [33; 45]. For G. Piaget, play is an indicator of development rather than its engine. Its emergence in children of about 18 months signifies the development of the semiotic function — an ability to represent an absent object or an event that is not directly perceived through symbols or signs. Paradoxically, J. Piaget's impact on researchers who held play to be important for development was enormous, although he himself did not consider play critical for the development of logical thinking which he studied.

If in the spirit of constructivism, J. Piaget believed the child to be a creator of its own cognition, L.S. Vygotsky, the founder of the other tradition, showed that cognitive development in play is primarily due to interaction between the child and a sensitive adult and other children [2]. Because children are capable of imagining something only from their own available experience, role play is predetermined by what is in culture. That is, children play at activities and roles that exist in a given culture.

T a b l e 1

Main theories of play

Theory Title	A brief summary of the theory
1	2
Early theories [38; 50; 56]:	
G. Spencer's theory of surplus energy (1878)	Play is an uncontrollable desire, a way to "let off steam", to spend excess energy in childhood.
M. Lazarus's Theory of Relaxation (1883)	Play stems from a lack of energy and is needed to restore strength after work.
Theory of Exercise by K. Groos (1899)	In a broad sense, play is the training of instincts and skills that will be needed in future adult life. For example, playing parents trains parenting skills.
Theory of recapitulation by S. Hall (1886)	Ontogenesis repeats phylogeny, and in play the child plays out the developmental stages of the human race: the animal, the savage, a representative of traditional society, etc. This helps the child get rid of primitive instincts that are superfluous in modern society.
Pedagogical theory of play by J. Dewey (1900)	Teaching should be reduced mainly to play and labor activity, where each action of the child becomes an instrument of his knowledge, his own discovery, a way of comprehending the truth. By reconstructing its experience in play, the child perceives the meaning of it and develops consciousness and skills.
Classical theories:	
The Psychodynamic Theory of Play by Z. Freud (1920)	Play is necessary for children's emotional development. In play children can live out the fulfillment of their wishes, cope with traumatic experiences and strong negative feelings [38; 50; 56].
L.S. Vygotsky's Cultural and Historical Approach (1933)	Play is a culturally conditioned phenomenon at the same time it is "imbued" with the child's personal meaning and imagination. Peer play is of special importance. It is a transitional stage from a child's thinking, limited by the properties of the current situation, to the thinking that is completely free from these limitations [2].
Cultural Theory by J. Huizinga (1938)	Human culture occurs and unfolds in play. Play is older than culture, because all the main features of play can also be observed in animals. Every game has certain rules, performs certain functions and brings pleasure and joy [38; 50; 56].
The theory of socialization by G.H. Mead (1934)	Play is a model of social interaction and a means of assimilating social attitudes, and thus is a means of formation of a socialized personality. Play role is the equivalent of a social role. Initial social attitudes arise in free role-playing with changing roles, more complex and generalized — in a game that has rules due to the fact that it is necessary to take into account simultaneously different role positions [4].

Theory Title	A brief summary of the theory
1	2
Cognitive theory of play by J. Piaget (1945)	The development of play takes place spontaneously, according to the stages of intellectual maturation, which moves in the direction of an increasingly adequate reflection of reality. Spontaneous play is the prevalence of assimilation processes over those of accommodation. Three types of structures are typical for children's games: exercise — symbol — rule. The development of play is connected with the successive change of these structures [45].
D. Berlyne's Arousal modulation theory (1960)	Play helps to maintain optimum excitement in the child's central nervous system. Stimulation, such as the appearance of a new object, increases excitement. Playing with this object helps to reduce excitement, because it becomes familiar and customary in play. Lack of stimulation leads to boredom and search behavior [38; 50; 56].
J. Bruner's Theory of Development (1968)	It focuses on the drama function in developing behavioral flexibility. In play, children focus on their behavior and do it without looking at the end result, experimenting and creating new behavioral combinations and practices which would be unattainable if children were under pressure to achieve the goal. New behavioral strategies that appeared in play later become part of more complex activities [38; 50; 56].
G. Bateson's metacommunication theory (1955)	Play is based on interaction that children engage in by playing together. Children make it clear to each other that they are playing and what is going on is not real, and in doing so they learn to act simultaneously on two levels: the imaginary one and the real one. Children learn not about the roles that they take on in a game, but about the concept of the role itself, so they learn to learn through play. Play is a metacommunicative context of reality and gives birth to a cultural and personal identity [38; 50; 56].
Modern concepts of play:	
Playworlds (G. Lindqvist, 1995)	Playworlds is a concept based on L.S. Vygotsky's ideas. It is a collective role-playing game for children and the teacher, who play complex stories with problematic situations, taken from stories and fairy tales. Playworlds provide a context for educational interventions, but it is important that the teacher be fully involved as a participant or a character in the play. This enables him to put educational tasks in the context of an imaginary situation, thus not only achieving pedagogical goals, but also developing and inspiring the game [36; 40].
The ambiguity of play (B. Sutton-Smith, 1995)	Without associating himself with any of the theories, B. Sutton-Smith tried to view play from all possible perspectives. Among other things, he pointed to the duality of play and its "shadow" aspects: play may prove to be a very painful experience for a player, and children in play not only recreate the social order, but also destroy it. Play needs to be studied in the perspective of a lifetime because adults, like children, get involved in all types of games [61].
The cultural-activity concept of play (B. van Oers, 2013)	It is based on L.S. Vygotsky's cultural-historical approach and A.N. Leontiev's theory of activity, but it places even greater emphasis on the cultural foundations of play. As a phenomenon, play depends on cultural values and decisions. Play is an activity with a high level of involvement of its participants who follow certain implicit or explicit rules and have some freedom in interpreting these rules and choosing other elements of this activity (for example, attributes, goals, etc.). Each activity can in principle take the form of play if children participate voluntarily, follow the rules, and are at liberty to choose how to carry out this activity [42, 43].
Play as the Zone of proximal development (G.G. Kravtsov, E.E. Kravtsova, 2017)	Following L.S. Vygotsky, they consider an imaginary situation to be the criterion of play and emphasize its dual-positional aspect as its essential characteristic. Play has characteristics similar to those of the proximal development zone. Developmental preschool education is considered in terms of creating conditions for forming and developing the two-subject nature. It is to accomplish three objectives: to form psychological readiness for play, to teach how to play and to use play as a learning means [5].
Play as a form of freedom and autonomy (E. Singer, 2015; E.O. Smirnova, 2019)	Elements of play in early childhood are pleasure, a sense of freedom, and co-constructing a common meaning through rules and rhythms. Considering the features of early education, Singer argues that play and "playfulness" should be its key characteristics. But when there is predominant focus on educational tasks in play, this aspect of play is lost [30, 52]. In Russia, similar ideas were expressed by E. O. Smirnova, who emphasized that a child's personal development takes place in the child's initiative independent actions. And play is the main form of manifesting this initiative while adults' protective, gentle attitude towards children's safety and autonomy tends to block the child's display of initiative [9].

Classifications of play

In considering a child's natural (without an adult) play as a basis for the child's psychological well-being, B. Hughes describes 16 types of play: communication play, creative play, deep play, fantasy and imaginative play, dramatic play, exploratory play, locomotor play, object play, mastery play, recapitulative play, role play, rough and tumble play, social play, social-dramatic play and symbolic play [15]. This totally descriptive typology contains the names of games generally accepted in foreign literature, and also shows how unlike it is, for example, compared to the domestic classification, which is built on different foundations: directorial, figurative,

storyline and role play, play with rules and play according to rules [5].

Games are also classified according to the degree of the child's socialization in play. Development is considered to evolve from solitary play (a child plays by itself with objects/toys) to parallel play (children play nearby with similar objects/toys, i.e., share their space playing a solitary game) and associative play (children interact with each other by exchanging play materials). The highest level of socialization in play is cooperative play that occurs between two or more children when they start exchanging ideas about play and toys. Rules appear in such a game and everyone knows what role he or she is playing. The key difference from the previous stages is the emergence of communication about play itself [54].

Researchers pay special attention to pretend play. The classics believed this particular type of play to be dominant in preschool age and, in general, never considered the phenomenon of play in the perspective of a lifetime, as they held that play is important for development only in preschool childhood. In foreign literature, pretend play is an umbrella term for variants options of games that include an element of make-believe, acting, or "as if" presentations: dramatic play, role play, fantasy play, and playing with substitute objects [33; 62]. At the same time, play may be solitary or social pretend play and may partially combine with other types of play. For example, locomotor play combines with pretend play if children pretend to be fighters in the ring [62].

Play structure

Consideration of different theoretical approaches to play shows that they focus on different aspects of pretend play: affect, interaction between players and an adult, treatment of objects / toys, the degree of role acceptance, the content of play, the themes and complexity of stories, the nature of play actions, the system of rules and ways of play organization, the frequency and duration of games, etc.

L.S. Vygotsky believed that pretend and role-play had three key characteristics: children create an imaginary situation, assume roles and act upon them, and also follow a set of rules dictated by their specific roles. Each of these aspects is important and contributes to the development of higher mental functions [2].

D.B. Elkonin made a distinction between the theme of play (the sphere of reality that is reflected in the game) and its content (what from this sphere is precisely reflected in play). To describe the levels of play development he used four parameters: the content of play, roles, character and logic of play actions, and also the child's reaction to the breach of play logic [16].

B. Thompson and T. Goldstein attempted to formulate the hierarchical model of play based on the analysis of almost two hundred modern articles on the relationship between play and child development. They identified the following stages/components of play: (1) object substitution (using an object as if it were not what it really is), (2) attributing imaginary properties/animation (attributing the properties of a living thing to an object that does not have them), (3) social interactions within a pretend act (two or more children agree to replace an object or attribute imaginary properties verbally or non-verbally), (4) role acceptance (the child pretends to be someone when interacting with other children) and (5) metacommunication involved in play (planning, agreements, rules, role distribution in order to organize role-play that includes complex scenarios and stories). In the authors' opinion, it is sufficient for a child to demonstrate any of these components to enable him or her able to say that there is pretend play going on. In this case, more advanced components include all lower levels [58].

Play development

It is noted that when talking about the development of play most foreign researchers somehow reproduce the sequence described by J. Piaget: from sensorimotor to symbolic play and then to play with rules, the central element of which is symbolic representation and use of objects in an unusual, non-literal way. According to J. Piaget, typically developing children start to engage in this type of play before the age of 2 years and it reaches its climax when they are 3—4 years old and gradually fades away before the age of 6 years, although some children continue to play at an older age [42; 45].

In line with the cultural-historical approach, there are more meaningful concepts. One of them has been developed by E.E. Kravtsova and G.G. Kravtsov [5] and traces play development up to the adult age. The first kind of independent, "real" children's play is directorial. It is still very similar to the object-manipulative activity, but already has all the features of play: dual-subjectivity (the child controls the progress of a game, but is also a participant in it), an imaginary situation (actions with objects gain meaning in its logic), toys and objects are used as means for plot realization. Then at the age of 3—4 there emerges imaginary play when a child identifies itself with someone or something and tries in its behavior to reproduce what it has identified itself with. There is neither pretend or role relations typical for pretend and role play which is due to emerge at the next stage — at the age of 4—5. This kind of play combines figurative and directorial lines of play development and mental development. If the previous two play types were mainly individual, then pretend and role play, even being realized by a single subject, is collective in its nature and implies obligatory interaction with other people, play partners. At the next stage of development comes play with rules (5—6 years) in which play actions are strictly subordinated to a concrete set of rules, and the rules define the character and features of the game itself. Appearance of play with rules coincides with the end of preschool age. Based on the two-subject criterion the authors, however, consider play development further: play according to rules (younger schoolchildren), literary play (teenage age), theatrical play (older teenage age), play with the image of "I" and playing at jobs (youth age) and, finally, adult games.

B. van Oers [42] offers his own view of play and its development in ontogenesis, based on A.N. Leontiev's theory

of activity. He believes that from the point of view of activity, play appears to be an absolutely cultural construct based on cultural traditions, practices and beliefs about how, when and why it can take place. In this case, play development is a process of self-regulation development through mastering more diverse and increasingly complex rules. It is the development of the ability to continue to play in increasingly complex and culturally regulated activities under the conditions of freedom admissible by established practice. Indeed, anthropological research has found pretend play to be present in all cultures. However, the frequency, themes, and parental involvement in these games vary from culture to culture. Family and social values are an important source of these differences [33; 46].

Contemporary play research

Over the past few decades, a large amount of data has been accumulated to support L.S. Vygotsky's thesis about the key role of play in the development and education of preschool children [35]. Pretend play is believed to contribute to the development of social skills, creativity, intellect, theory of mind, executive functions, emotional regulation, counterfactual reasoning, symbolic thinking, and the ability to solve problems and provide arguments [1; 6; 22; 24; 28; 32; 34; 35; 39; 48; 53; 57]. There are also studies linking play and academic results [41; 59; 60]. At the same time, based on the outcomes of extensive research analysis, A. Lillard and colleagues had to state that if play was really related to a child's development, it was still not obvious how critical this connection could be as there was a lot of evidence in favor of equifinality (play helps development, but it is only one of possible routes of development — other activities may work the same way or even better) and epiphenomenalism (play is an epiphenomenon or a by-product of another activity or condition that actually contributes to development) [35]. Much of this uncertainty is due to methodological difficulties in evaluating play and the imperfection of the tools that exist for this end. In addition to finding links between play and child development, contemporary research also examines play in the context of learning: how an adult can participate in play and use it for educational purposes.

Play and learning

All variations of approaches to the construction of "playful" learning are based on the cultural-historical theory of L, S. Vygotsky and the works of D.B. Elkonin and A.N. Leontiev. In particular, L.S. Vygotsky's thesis that an adult (teacher, educator) is needed to expand the cultural and social experience of a child that could form the basis of his or her imagination and enrich the child's play, acquaint the child with new forms of play and support its development [17; 43; 46; 47].

In foreign literature, there are a number of terms that reflect the use of play in the education of preschool children: playful learning, play-responsive learning, play-based learning. In general, play-based learning is a peda-gogical approach that combines playful, child-initiated elements with the intervention of an adult who pursues some educational objectives [47]. Playful learning is an umbrella term that includes what is called both free and guided play [31]. Both types of play promote learning, but in guided play the adult pursues a certain educational objective and structures the gaming space accordingly. He can do this in two ways by simply providing suitable materials (e.g., paints to help them learn how to distinguish colors) or by joining the play. The adult's participation in play, however, requires certain conditions to be met. In order not to ruin the child's play, the adult should not restrict the child's freedom or impose rules that contradict children's playing needs at that moment [42; 43].

P. Hakkarainen identifies criteria for a successful adult intervention in children's role-playing game: the idea of play should come from children while the adult actively participates in the discussion and helps to develop it; the adult grows into his role and plays too; the adult is emotionally involved in the game; he enters into spontaneous dialogues from the role and participates in the play events; he supports dramatic tension in the story, helps to develop a coherent and fascinating story; he promotes dynamics and involvement (for example, when the game might have become boring, the adult introduced a new character or a turn of events) [29].

Based on their interviews and observations in kindergarten groups, A. Pyle and E. Daniels identified five different play types that form a continuum in adult involvement: free play; assistance in a game where the teacher expands the children's free play by making thematic "inputs" (e.g., bringing books about planes to children building an airplane); and collaborative play with a shared locus of control (the teacher and children together devise a context for a game, including the topic and necessary materials); play-based learning as an integration of skills that do not normally occur in play in a natural way (e.g., counting and recording the number of flowers in a flower store); didactic games designed to teach certain mandatory mathematical and linguistic elements [47].

M. Fleer also uses free play observations to formulate a typology that reflects a teacher's actions and position in relation to the imagined situation: the teacher's proximity to the game; the teacher's intention is parallel to that of the children; the teacher follows the children's game; the teacher is involved in conversations with the children about the imagined situation in their game; the teacher is inside the children's game [37].

In the domestic tradition, the role of communication with an adult in the development of play was highlighted by M.I. Lisina: the emergence of role-playing is genetically associated with the formation of object actions under the guidance of adults in early childhood and with a change in the nature of communication, when a child begins to look for an adult's attention and approval of his or her own play and object actions [3]. E. O. Smirnova, a student of M.I. Lisina, introduced and analyzed the concept of "a teacher's play competence". She considered different variants of the educator's position in children's play: detached, didactic and supporting, all of them being based on play competence. A teacher with a detached

position does not pay attention to children playing, taking a "let-them-play-as-they-want" attitude to it and regarding it a useless activity. When he assumes a didactic position, all the teacher's activities are aimed at teaching children to play. Being aware of the importance of play for development, the teacher wants children to play correctly, so he himself allots the roles, provides the game plot, prompting them who is to say what, etc. Such an educator is characterized by confidence in his or her judgment and desire to pass their knowledge and experience to children. And if children deviate from a given course by showing initiative, it is perceived as a violation of the norm which has to be suppressed.

The teacher's supportive attitude aims to back children's initiative in a game. The teacher is both a partner in, and organizer of, a game. The degree and nature of his or her involvement depend on children's situation and play skills. To show children examples of higher-level play, the teacher may address them on behalf of a new role, to suggest a new turn of the plot if the game gets "stuck", and to take on an additional role that stimulates plot development.

Such a teacher plays along with children and his or her play competence consists of three main abilities: developed imagination that makes it possible to overcome stereotypes and create new images and plots; emotional expression and artistry that involve children in an imagined situation; and, finally, support for children's own initiative and autonomy and confidence in their own abilities [8]. In doing so, E.O. Smirnova contrasts play as an independent activity and play-based learning tools. The use of play-based learning methods implies not only an adult's initiative but also his or her direct guidance. For example, games based on adult-developed scenarios, the use of toys or fairy-tale plots in class have nothing to do with real play and do not lead to the development of a child's independence [7].

Play research methods

To assess preschoolers' play activity, E.O. Smirnova developed a method that procedurally consists of observation in specially created conditions [6]. After an object environment has been modeled in the playroom, a group of 2-4 children are encouraged to play on their own. Observers assess a game which is free from adults' suggestions or images that are embodied in toys. Among the materials offered to children, are the multifunctional, "open" materials: fabrics of different textures, a roll of fabric, clothespins, ropes, ribbons, ribbands, elastic bands, small logs and sticks, wooden rings, cup liners, chestnuts, cones, cardboard boxes of different sizes, etc. All these materials are placed within the children's reach. On average, a group of children is observed for 40 minutes. The following blocks and indicators are assessed in conditional points from 0 (total absence) to 3 (a high degree of manifestation): substitution level (object, positional, spatial ones); interaction (organizational and intra-play); and the play plan (level, extent, execution and sustainability of the play idea).

Let us also consider several frequently mentioned and widely-used foreign methods [20; 23; 25; 48; 49; 55; 58].

Child-Initiated Pretend Play Assessment (ChiPPA) is an observation-based methodology that both assesses play in specially created conditions and excludes adult intervention. But unlike the previous method, it assesses solitary play. First, the child is offered toys with clear functionality (for example, miniature animal figures) and then unstructured materials such as pieces of fabric and sticks. The observation lasts for 18 or 30 minutes. The observers assess the level of complexity and self-organization in the game: the percentage of specific play actions, the number of object substitutions and the number of imitation actions. The tool was created for therapeutic practice and it also makes it possible to define play themes and styles that indicate possible deficits in the game.

The Affect in Play Scale — Preschool (APS-P) is another standardized observation-based tool that focuses on affective manifestations and cognitive components of play. The child is told a short unfinished story and then is asked to play on his or her own and simultaneously is provided with a set of plastic animals, cups, a car toy and a rubber ball. The session is recorded on video.

Same as in the previous method, solitary play alone is assessed here. The scale of cognitive assessment includes play organization (quality and complexity of the plot), imagination (novelty and uniqueness of play), comfort in play (engagement in, and pleasure from, play). The scale of affect estimation includes frequency of affective manifestations, variety of affective manifestations (from 11 affective manifestations: happiness/ satisfaction; anxiety/fear; sadness/pain; frustration/dissatisfaction; care /bonding; aggression; oral aggression, etc.), the intensity of affective manifestations (on a scale of 1 to 5). As seen from the list of the indicators being assessed, the methodology is developed in line with the psychoanalytic approach in order to, first of all, provide information for planning therapeutic interventions and tracking their effectiveness. Therefore, here play serves rather as a context for assessing the psychological state of the child.

The Test of Pretend Play (ToPP; formerly known as the Warwick Symbolic Play Test or WSPT), unlike previous tools, is a structured test method that focuses on the symbolic aspects of play and offers verbal and nonverbal test options for children aged 1—6 years: with items from everyday life, with toys and unstructured materials, with toys only or without toys and materials.

During the test session, the tester invites a child to play and provides standardized hints if necessary. Three types of symbolic play are assessed: object substitution (for example, a napkin as a blanket), referring to a missing object as if it were there (for example, drinking imaginary tea) and assigning imaginary characteristics to an object (for example, the doll is sick). In addition, the child's ability to link several symbolic actions into a meaningful sequence is assessed. Raw test scores can be translated into age norms. The theoretical basis of this test is also evident from its design and assessed parameters — the theory of J. Piaget and the psychology of development, where play is an indicator of the child's level of cognitive development.

The Smilansky Scale for the Evaluation of Dramatic and Socio-Dramatic Play (SSEDSP) assesses peer play through in vivo observation of free play. The duration of

the observation is 20 or 30 minutes, this time is divided into short intervals. Qualitative and quantitative assessment allows one to draw conclusions about the level of development of the storyline and pretend-role playing. The test assesses the presence or absence of six pretend play elements, four of which are typical for solitary play, two for peer-only play: imitation (figurative) pretend-role play, object substitution, make-believe when referring to actions and situations, duration of role play (at least, 10 minutes long), interaction (at least, two children interact in the context of a play episode) and verbal communication in play. The play environment should include materials associated with a household, a hospital, a store, unstructured materials, clothes for changing and a set of tools. The scale was originally designed to assess the development of play among children at risk level from low-income families.

The Penn Interactive Peer Play Scale (PIPPS) is a 32-point questionnaire with versions for parents and teachers. Just as the previous scale, it was designed to do research on children from low-income families. The teacher/parent should note how they observed a particular behavior in a child's free play. Three parameters are evaluated on the Likert scale: disruption of the play process, quitting the game and active participation in play interaction. That is, it is not play itself that is evaluated, but the nature of interpersonal interaction with peers in the context of play.

From this brief description we can see how the understanding of play and the content of methodology depend on the purpose of its creation and the theoretical basis. Most methodologies focus on the child and not on play. Play serves as a means or context for diagnosing the child's social adaptation, affective or cognitive spheres. Of the methodologies described in this article, only two are directly focused on the evaluation of play and its significant components, and both of them are developed within the cultural-historical approach, reflecting the definition of play given in the works by L.S. Vygotsky and D.B. Elkonin (the Smilansky Scale for the Evaluation of Dramatic and Socio-Dramatic Play and E.O. Smirnova's Method of Evaluating the Level of Play). Their comparative description is provided in Table 2, which shows that the national method allows for the most complete and differentiated assessment of the level of children's play development. It is noteworthy, however, that none of the methods reflect how a child experiences play and play events [37] and record the theme and content of play [16].

From the point of view of the application procedure the methods can be divided into several categories: observation in vivo; observation in laboratory (specially created) conditions; structured task-based methods; a questionnaire for adults from the child's environment (teachers, parents). There are also methods that are based on self-reporting, but they are usually designed

Table 2

Comparison of play evaluation methods: The Smilansky Scale for the Evaluation of Dramatic and Socio-Dramatic Play and E.O. Smirnova's Method of Assessment of the Play Activity Level

Description of the method	The Smilansky Scale for the Evaluation of Dramatic and Socio-Dramatic Play	E.O. Smirnova's Method of Assessment of the Play Activity Level
1	2	3
Procedure	Observation in the natural environment	Observation in specially created conditions
Object of observation	Free play — solitary and with peers	Peer play
Duration of observation	20 or 30 minutes long, divided into 5-minute intervals	40 minutes
Materials	Toys and role play attributes imitating real objects	Polyfunctional "open" materials
Scale of evaluation	The Likert Scale from 0 (total absence) to 3 (vivid degree of manifestation)	The Likert Scale from 0 (total absence) to 3 (vivid degree of manifestation)
Evaluation result	Level of pretend play development	Level of pretend play development
Evaluated Play Components according to Thompson & Goldstein, 2019		
(1) Substitution of objects;	+	+
(2) Assignment of imaginary properties/animation;		+
(3) Social interactions within make-believe;	+ (actions and verbal communication in play)	+
(4) Role acceptance;	+ (image role play and make-believe about actions and situations)	+
(5) Metacommunication related to play organization;		+
	+ duration of a play episode	+ Spatial substitution (creation and semantic differentiation of the play space)
		+ evaluation of the play plan (level of the idea, its expansion, execution of the idea and sustainability of the play idea)

for older children and adults. An example of this method is the Fantasy Play Interview/Imaginative Play Predisposition Interview, where a child is asked about his or her favorite play, what he or she likes to do alone, about talking to himself or herself and thoughts before going to bed, etc. The interview assesses play orientation to find out if it is fantasy-oriented or reality-oriented [20].

Conclusions

1. Play in childhood is an extremely complex phenomenon. It starts and becomes more complex in ontogenesis at a preschool age, it may take different forms and serve purposefully for developmental and educational goals. Play is actively and widely studied by using different methods including a formative experiment. The literature analysis demonstrates confusion and vagueness of the terminology due to a large scattering of theoretical views and methodological approaches to play research. This creates major methodological difficulties in the development and conduct of empirical research and influences the results of these studies, and, consequently, the ideas about the impact of play on a child's life.

2. The two classical views on preschool children's play continue to significantly determine modern research trends in this area. According to the first point of view formulated in J. Piaget's operational theory of intellectual development, play is seen as an indicator of development rather than its driving force. The followers of the second point of view, which is based on the cultural-historical concept of L.S. Vygotsky [1; 2; 5; 39; 53], describe play as a leading activity for preschool children in the course of which the child development takes place (L.S. Vygotsky, A.N. Leontiev, D.B. Elkonin, etc.).

3. The scientific literature presents various play classifications. Their differences are determined by the interpretation of the phenomenon of play, which is based on the author's theoretical positions, the age group of the participants in play, and other characteristics [5; 15; 18; 27; 29; 35; 44; 50; 55; 62]. The absence of a generally accepted classification and play theory indicates the relevance and necessity of research into this problem.

4. Modern research presents two sets of data, some of which confirm the leading role of play in child development [22; 24; 28; 32; 34; 57]; others indicate a limited impact of play on child development [35].

5. The publications reflect a strong trend towards a search for ways to use the play format in preschool education [43; 46; 47]. At the same time, it is noted that an educator can take different positions ranging from that of an active participant and leader of children's play to that of a neutral observer [26].

6. There is a variety of scales for assessing the level of play development. Most of them focus on the assessment of the child rather than that of play itself [20; 23; 25; 48; 49; 55; 58]. An informative assessment of a child's play is made possible by using the scales based on L.S. Vygotsky's cultural-historical theory of [6].

7. We believe that further research into children's play issues could focus on a detailed study of options for using play in the education of preschool children: what and how can be purposefully formed through play, what play components are the most significant, i.e., what is the mechanism of forming these or those new structures, how children themselves experience and what they think about play and their learning through play. An important task of future research is also to create a valid and reliable tool for play assessment that would also be conveniently used in large-scale research.

Final conclusion: E.O. Smirnova's contribution to the study of play

Elena Olegovna Smirnova (1947—2020), a continuator of M.I. Lisina's scientific school, made a great contribution not only to the scientific but also practical study of play. Under her guidance, a method of psychological and pedagogical examination of toys and play materials was developed, and a cycle of studies was conducted to examine the impact of toys on children's play as well as various aspects of modern children's play activities [10; 11; 12; 14]. In her works, Elena Olegovna showed the importance of play for a child's personal development and drew attention of the professional community to a serious problem — the displacement of play from preschool education. She emphasized that play as an independent activity is now being replaced by play-based learning tools and she studied the conditions for play formation and development in the preschool education system [9].

E.O. Smirnova understood like nobody else that the improved quality of play research design is possible only if there are adequate assessment tools corresponding to the conceptual foundation of the theoretical basis developed on the principle of the cultural-historical approach and activity theory. The work that has been done by Elena Olegovna Smirnova provides a sound base and opens up a wide horizon for further research into the play activities of preschool children.

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Современные проблемы детской игры: культурно-исторический контекст

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Цель настоящей работы заключается в анализе состояния современных исследований детской игры, рассмотрении подходов к ее изучению, а также существующих методик ее оценки. Актуальность обращения к теме обусловлена ведущей ролью игры в дошкольном детстве и сложностью этого феномена. Игра активно изучается, в том числе с использованием формирующего эксперимента. Однако анализ литературы показывает смешение и неопределенность терминологии вследствие большого разброса теоретических позиций и методологических подходов к изучению игры. Это создает большие трудности при планировании и проведении исследований, сказывается на их результатах. В статье рассмотрены вопросы определения игры, понимания ее структуры и развития, классификации игр. Показаны основные тенденции современных исследований и их связь с классическими теориями игры, роль культурно-исторического подхода и вклад Е.О. Смирновой в изучение игры.

Ключевые слова: дошкольник, детская игра, сюжетная игра, развитие игры, структура игры, теории игры, культурно-исторический подход, игровое обучение, методики оценки игры.

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Engagement in Learning in the Massive Open Online Course: Implications for Epistemic Practices and Development of Transformative Digital Agency with Pre- and In-Service Teachers in Norway

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This study examines how participants engage in learning in the Pedagogical Information and Communication Technology (ICTPED) Massive Open Online Course (MOOC) aimed to enhance Norwegian pre- and in-service teachers' professional digital competence. The study also provides an insight into how participants' engagement in learning in the ICTPED MOOC may have enhanced their transformative digital agency. Analyses of participants' engagement in learning draw on P.Y. Galperin's pedagogical theory. The data comprised 310 participants' responses to the questionnaire administered to all pre- and in-service teachers engaged in the ICTPED MOOC in 2016—2019. Mixed methods were applied for data analyses by providing quantitative and qualitative evidence about the participants' engagement in the course. Findings reveal that the majority of participants engaged in learning by reading the textual information embedded in the course. In doing so, they followed the sequential progression informed by the course design. Other participants engaged in learning by watching the videos and listening to the audio files embedded in the course as well as by attempting the assignments and other activities. By following these approaches, the participants created their individual learning trajectories and therefore may have enhanced their digital agency and affected the epistemic practices in the course.

Keywords: Online learning, Massive Open Online Course, epistemic practices, transformative digital agency, Galperin.

Introduction

This study examines participants' engagement in learning in the Pedagogical Information and Communication Technology (ICTPED) Massive Open Online Course (MOOC) aimed to enhance the professional digital competence (PDC) of pre- and in-service teachers in Norway. The study also provides an insight into how participants' engagement in learning may enhance their agency as independent and conscientious learners in digital environments. Research describes teacher PDC as a multifaceted concept that involves a wide range of knowledge, skills and attitudes required when using information and communication technology (ICT) in teaching and learning [26; 35; 36; 42]. Continuous advances in digital technology urge

teachers as professionals to constantly develop their digital competence [5] and, by engaging in teaching practices, enhance the development of their students' digital competence [21; 25; 49]. The emphasis on the developmental aspect makes teachers' PDC to be inherently connected with teacher agency as digitally competent teachers. Researchers have discussed the usefulness of MOOCs for enhancing teachers' professional development [8; 28; 29; 55]; however, little research has explored how teachers engage in learning in MOOCs with the aim of enhancing their PDC. This study addresses this gap by examining how pre- and in-service teachers engaged in learning in the ICTPED MOOC to develop their agentic capacity as digitally competent teachers. Such a discussion is timely in light of the current reflections on the epistemological

and ontological consequences of digitalisation that affect educational practices [32; 33; 53].

Epistemological and ontological aspects of transformative digital agency

This study adopts the Vygotskian view on agency, wherein agency is considered as an active pursuit to develop human cognition within collective, material-semiotic activities embedded in the sociocultural world [50]. Participants engage in activities that are not only enacted and fluid but also continuously developed by them. Such a perspective emphasises the *ontological aspect* of human agency, positioning humans as the social actors and agentive co-creators of the practices they engage in. This resonates with the views and understandings of learners' agency as an ability to propel themselves forward while recognising and responding to the demands in tasks and with increasing competence, to reposition themselves within a knowledge domain [14; 37; 40]. Although such an agentic capacity is developed in learners through their individual contributions, the collective dimension is primary because each contribution is relational, representing a nexus of interactions with other people, history and the world [50]. In many ways, participants' engagement in learning in MOOCs can be seen as individual contributions to the collectively developed practices initiated by the team of MOOC designers. When engaging in learning, participants reposition themselves within these practices to move forward by creating their learning trajectories. To do so, students need to orient themselves among the variety of available resources and activities, select the appropriate ones and adopt them according to their learning needs. From this perspective, learners' digital agency in MOOCs reflects the capacity to select appropriate digital resources, utilise them in the learning activities and therefore reposition themselves in the knowledge (epistemic) practices in the pre-designed digital environments. Learners' digital agency is of transformative (ontological) nature [7] and may reflect the participants' growing capacity in learning to learn [16; 18]. Therefore, the digital agency that participants may develop by engaging in digital environments has epistemological and ontological grounds. The unique aspect of learning in MOOCs is that students' actions are embedded in digital learning environments and may therefore exemplify new *epistemic (embedded) practices* [51]. By engaging in such practices, learners may develop their *embedded cognition* [32; 53]. Understanding students' embedded practices is of primary importance for the design of digital learning spaces to enhance learning and the development of students as independent and conscientious learners. This complex matter can be addressed by examining how participants engage in learning to enact the design of MOOCs.

Learning activities in online courses and MOOCs

The activities that students may engage in online courses constitute a learning design that is described as a methodology to make informed decisions in how to design learning activities in digital spaces [10] and that may have a significant impact on learner experience [41]. G. Salmon [47] offers a five-sage model to design online learning courses: 1) access and motivation; 2) online socialisation; 3) information exchange; 4) knowledge construction and 5) development. This model is argued to possibly enhance online learning, favourable contributions, interactions among participants and increased student satisfaction. Based on the investigation of the frequently used pedagogical tools in 24 MOOCs, it was reported that although the pedagogical approaches had significant variations, most online courses utilised traditional classroom methods, such as lectures, group discussions and multiple-choice assignments [52]. The findings showed that students were more satisfied with online courses that included social interactions and reflections, and a major challenge for MOOC instructors was to create premises for students' interactions and engagement. J. Kasch et al. [27] designed a framework that integrates four common educational design principles to support formative assessment and feedback in MOOCs. The analyses results of utilising the framework in five cases studies indicated that providing quality feedback at a large scale with low teacher costs is challenging in MOOCs and this can be improved by adding scalable feedback methods, such as sum-up videos that respond to student needs and lectures videos that guide students through the several scenarios that can be applied in MOOCs. Improvements are also needed in multiple-choice assignments and can be achieved by increasing the diversity of question types and answer options [27]. Another review of 102 studies on learning and teaching in MOOCs identified four key learning and teaching factors: learner factors, teaching context, learner engagement and learning outcomes [13]. The authors reported that the systematic research on learning and teaching trends in MOOCs is limited and that the relationships between many learning and teaching factors in MOOCs have not been identified.

In an attempt to address participants' learning in MOOCs, the motivation and self-regulated aspects of learning in online environments have been investigated and the correlations between self-regulated learning behaviour and academic achievement have been identified [4; 24; 31; 48; 58]. The studies show that participation in MOOCs challenges learners to develop self-organisation and self-motivation as well as a reasonable amount of technical proficiency to manage the abundance of resources and the more open format of courses [34; 46]. These findings suggest that learning in MOOCs is complex and nuanced and that learners are in need of resources to enhance their agentic capacity to learn [18]. W.M. Rønning [43] examined the participants' motivation and other factors that contribute to their ability to complete online courses and revealed that participants are motivated by personal acknowledgement, career-related motivation and the need to enhance their professional knowledge and skills. The study further reported that although the contact among participants was scarce, the facilitation of participants' learning by the teachers was crucial for their completion of the course.

Other studies addressed the social aspects of learning in online environments. For example, C. Dalsgaard and M.F. Paulsen [12] argued that cooperative learning (comprising unique individual contributions of the participants) allows them to have optimal individual freedom within online learning communities. It has been indicated that both cooperative and collaborative learning may be enhanced in online environments [1].

Several studies have explored the potential of MOOCs for teacher professional development (PD) [8; 28; 29; 55]. PD MOOCs might support a co-learning model of the community of teachers by utilising the features of a co-learning approach: i) issue-focused discussion forums that elicit valuable community discussions, ii) peer-assessed assignments that enable teachers to learn from each other and iii) discussion forums linked to off-platform tools for sharing resources and ideas [29]. Researchers emphasise the importance of flexible training methods owing to the rapid technological changes, and the decreasing resources for the formal education of teachers [28]. Other researchers have suggested an approach to develop a free teacher PD MOOC and examined the participants' engagement and experience in the course [55]. The participation and engagement rates in this MOOC have been successful, and the use of the Google+ community to share and build a repository of online resources, the short concept videos, the flexible learning pathways, the blend of content and exemplars as well as breaking down of discipline language and concepts into relatable items have proven to be useful design features of the course.

Although studies indicate that the design of online courses, teacher facilitation, resources and the activities in these courses are of primary importance for participants' learning, they tend to lack details about how participants engage in learning and enact the designs of digital environments. We examined pre- and in-service teachers' engagement in learning in the ICTPED MOOC by zooming in with the lens of cultural-historical theory.

Theoretical perspective

The founder of the cultural-historical theory, L.S. Vygotsky, suggested that human learning happens on the external (social) plane during practical tool-mediated activities. His argument was that tool mediation during practical activity initiates the changes in human consciousness and when applied in human activity these tools acquire special meanings and are internalised as signs. The tools used in the practical activity are externally directed to connect humans with the surrounding environment, whereas the tools transformed into signs are internally directed and lead to changes in the human consciousness to become the psychological functions of a person. This pathway reflects the processes of mediation, sociogenesis, and the internalisation of higher psychological functions. L.S. Vygotsky concluded that the process of sign mediation establishes new psychological functions and reorganises existing psychological functions whereas the sign acts as the structural and functional centre of newly developed psychological functions. In doing so, a sign becomes *a tool* for creating the structural and systemic organisation of human consciousness [17; 44].

When applied to newly emerged digital technologies, the boundary between tools and signs becomes indistinct and even blurry as often digital tools, such as computers and mobile phones, acquire functional significance of signs when used, for example, to interact on social media or to engage in online games [44; 57]. In doing so, digital tools and signs interplay and undergo mutual transformations to create a new reality in which social interactions influence the development of human consciousness.

Although L.S. Vygotsky was very clear about the primary role of practical activity in the development of human consciousness, he mainly focused on the investigation of the role of tools and signs, while the role of the activity that employed these tools appeared to be downplayed. Having acknowledged the significance of the foundations laid by L.S. Vygotsky, A.N. Leontiev suggested that the development of human consciousness is determined by neither concepts and meanings nor tools and signs on their own but by real life [30]. Consequently, he identified the activity connecting an individual with the surrounding environment as crucial.

In the context of digital environments, students' activities (individual, social or cultural) are embedded in the new medium. Each new medium, for example digital learning spaces, such as MOOCs, gives rise to a new epistemology as the new medium produces its own typical practices and products, activities and cooperation forms, its means, tools and devices as a medium between man and environment [45; 56]. Understanding how humans act in such new media would seem to be crucial.

The advances made by A.N. Leontiev posed a further question about how tool-mediated activities may enhance learning and the development of students as learners. An answer to this question was given by P.Y. Galperin, who connected the advances of A.N. Leontiev with the conceptual foundations of L.S. Vygotsky [17]. Building on L.S. Vygotsky's understanding that the development of new psychological functions occurs through social interactions during tool-mediated activities, P.Y. Galperin extended the legacy of L.S. Vygotsky by showing how this process occurs through the phases of the development of mental actions [15; 20]. These phases reflect the process of the gradual transformation from external actions with material or materialised tools (materialised action) through social communication (communicated thinking) and individual speech (dialogical thinking) to a mental action (acting mentally) [15; 20]. The transformation from materialised action to communicated thinking happens during learners' interactions with material or materialised objects and in making sense of these objects in speech. In the phase of materialised action, the action is directed outside, and it connects the learner with external objects and the outside world. The transformation from communicated to dialogical thinking happens by substituting the exter-

nally oriented speech by its image. In dialogical thinking, the action is directed inside the learner in establishing communication with himself or herself (as another person). The learner's ability to perform an action in the form of dialogical thinking reflects the pathway the action has undergone from its materialised to its dialogical form [20].

By introducing the phases of the development of mental actions, P.Y. Galperin defined the double role of an action (i) to interact and communicate and (ii) to transfer the meaning of the sign. Based on these premises, a sign has a double meaning: (i) its original meaning and (ii) its acquired meaning, which depends on the action in which it is employed. The sign's original meaning is presented as the generalisation of the reality. The sign acquires its second meaning in the context of a specific practical human social activity and the pathway of the development of meaning reflects the pathway of the development of learner's understanding of the surrounding reality. Such premises have significant implications for understanding of how humans learn.

P.Y. Galperin suggested that learning can be understood as an orienting activity of humans within the existing epistemic knowledge practices and available resources [2; 22]. P.Y. Galperin argued that to plan an action, it is necessary to create an image of an action. Any human action has a complex structure comprised of orienting, executive and control parts. The orienting part comprises two subsystems, motivational and operating, the latter of which reflects students' engagement in learning which occurs through the four phases or types of actions: (1) constructing the image of the present situation, (2) identifying the potential of the available tools and resources for the needs of the student, (3) creating a plan of action and (4) facilitating the action during its execution. In the first phase, students are exposed to the target concept, problem or task that has to be solved and develop their understandings about the target concept. In the second phase, students identify the available resources and reveal their potential. In the third phase, by utilising the useful resources, students create a plan of action. Finally, in the fourth phase, the action is being performed by comparing the enacted action with the previously created plan of action [2; 17; 20]. These four types of action are not only complex but also different. However, they are similar in the presence of images of one kind or another: an image of the present situation, an image of the plan of action, or an image of the action that is being executed. In summary, there are two types of images: images of the surrounding reality and images of ideal actions which, according to P.Y. Galperin, are nothing more than real, substantive, and external actions with material objects. However, ideal actions do not appear by themselves; they have to be created, and it is important to find or create a material action from which an ideal action could be derived. These two types of images constitute the two main components of human orienting activity. The four types of actions described above reflect students' engagement in learning, which may happen in three different ways and are termed by P.Y. Galperin as three types of orientations. (a) Incomplete, where learning (the four types of action described

above) happens through trial and error. In this case, learning takes place slowly with many mistakes and is extremely sensitive to the slightest changes in the conditions of the learning situation. (b) Complete, where students are informed in detail about the characteristics of the target concepts and about how they will engage in learning. This implies that the students are equipped with all the necessary mediational resources and the plan of action (what to learn and how to engage in learning). In this case, learning happens quickly and with minimum mistakes; however, the transfer of skills and knowledge developed during such a learning process is possible only when performing similar tasks or in similar learning situations. (c) Complete and constructed by students following an approach aimed at identifying the essential characteristics of the target concepts. Using this approach, a specific orientation can be constructed by the students suited to solve the problem at hand. With this type of orientation, learning happens quickly, with minimum mistakes, and the skills and knowledge developed during the learning activity can be transferred to other learning situations. Students develop their understanding of how to go about learning, and their agency as independent and conscientious learners may be enhanced [15; 16] . These three types of orientations will be used as a lens to examine how the teachers engaged in learning in the ICTPED MOOC. Such use of P.Y. Galperin's theory is innovative, and we are interested to explore whether the lens of the types of orientations will help in our analysis of teachers' engagement in learning in digital environments. The following research questions are addressed:

RQ1: How did the pre- and in-service teachers engage in learning in the ICTPED MOOC?

RQ2: How can teachers' engagement in learning in the ICTPED MOOC contribute to enhancing their transformative digital agency?

Method

Participants and setting
Data were collected through the questionnaire administered online to all pre- and in-service teachers engaged in the ICTPED MOOC in 2016—2019 on the completion of the course. It aimed to examine the participants' learning experiences in the ICTPED MOOC. The questionnaire included the following: (a) general information about the participants, (b) participants' learning experiences in the ICTPED MOOC and (c) teachers' facilitating of the learning process in the ICTPED MOOC. The questionnaire included 33 questions; some questions applied a five-point Likert scale and some questions required detailed answers. Tab. 1 shows the number of respondents to the questionnaire in 2016—2019, their professional background and general evaluation of the ICTPED MOOC.

ICTPED MOOC
The ICTPED MOOC was first introduced in Norway in 2016. The course was developed by researchers and development specialists from Østfold University College. The ICTPED MOOC has a structure of

an xMOOC; it is a built-in Canvas platform and aims to enhance the development of PDC with pre- and in-service teachers. xMOOCs is defined as institutionally focused, largely reliant on video resources and providing automated assessment through quizzes [3; 19], and all of these elements are present in the ICTPED MOOC. The ICTPED MOOC comprises eight modules to be completed by the participants over the course of 20 weeks.

Each module starts by introducing textual information (accessible as text on the page) and embedded research articles, complemented by relevant videos. Further, learners engage in individual tasks and reflection questions,

and they solve multiple-choice quizzes at the end of each module (summative assessment). Fig. 1 presents the typical structure of the modules in the ICTPED MOOC.

Small multiple-choice tests are used as formative assessment, and they are embedded in different places in the modules. Universal Design is integrated into the ICTPED MOOC, and audio files are embedded on every webpage. The participants can also download every module as an audio file, a podcast, a flat pdf file or an e-book. The list of the modules included in the ICTPED MOOC and the progress plan that the participants are to follow are presented in Tab. 2.

Table 1

The number of respondents to the questionnaire in 2016—2019 and their general evaluation of the ICTPED MOOC

Years	Number of respondents	Male/female mean (M)	Professional background (M)	General evaluation of the ICTPED MOOC mean (M) (SD)
2016—2019	310	Male M = 25.58% Female M = 74.43%	In-service teachers M = 73.4% Pre-service teachers M = 20.6% Other M = 8.8%	Very slightly satisfied M = 1.85% (1.65) Slightly satisfied M = 2.4% (2.41) Somewhat satisfied M = 6.76% (1.11) Strongly satisfied M = 52.96% (9.28) Very strongly satisfied M = 37.38% (10.82)

- Introduction
- Competency Aims
- Learning Outcomes

- Textual information on web pages
- Videos
- Research articles

- Reflection questions/Discussion forum
- Small multiple choice test

- Individual tasks/Examination tasks

- Summary Multiple-Choice Test
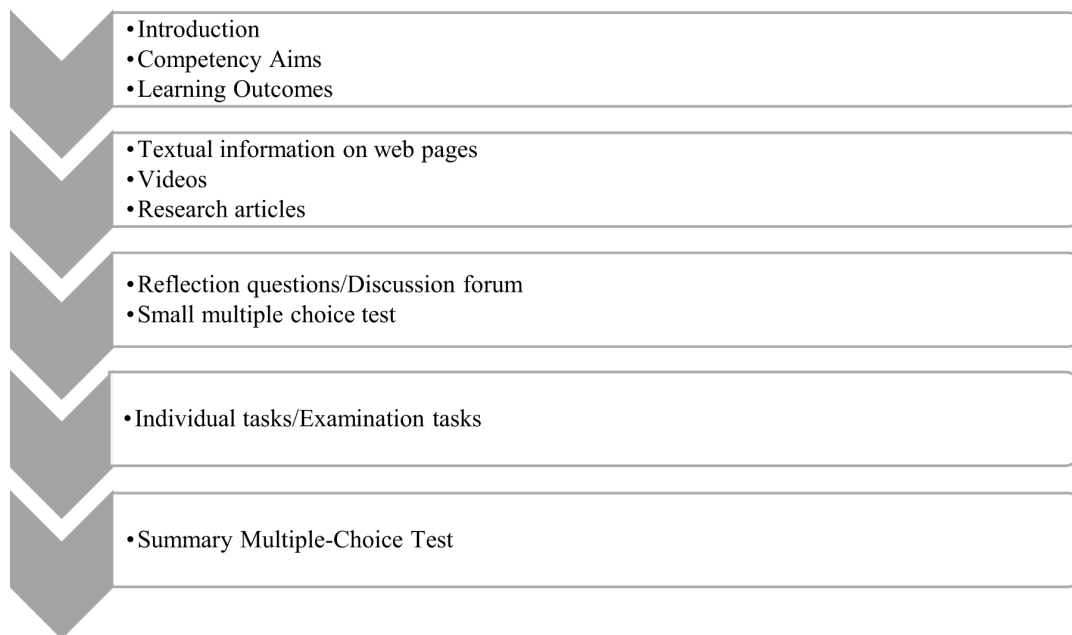
Fig. 1. The structure of the Modules in the ICTPED MOOC

Table 2

Progress plan and the modules in the ICTPED MOOC

Module	Progress plan (week)
0. Pre-course	2
1. ICT and learning	3—4
2. Digital studying techniques	5—6
3. Multimodal texts (examination module)	7—9
4. Cyber ethics	10—11
5. Classroom management in digital learning environments	12—13
6. Assessment for learning	14—16
7. Flipped classroom (examination module)	17—21

In several modules, participants are expected to give and receive feedback and submit examination assignments (in Modules 3 and 7). An example of the examination assignment included in Module 3 is presented in Fig. 2.

On successful completion of the ICTPEDMOOC (evaluated to pass and fail), participants are awarded 15 European credit transfer and accumulation system (ECTS) credits. Over 80% of participants passed the ICTPED MOOC in 2016—2019.

Data and analysis

To address the research questions in the study, the following questions were included in the questionnaire administered to the participants in the ICTPED MOOC in 2016—2019. (5) How did you usually engage in learning in the ICTPED MOOC? (Participants were to provide detailed descriptive answers.) (7) How did you use the available resources in the ICTPED MOOC? (Participants were to provide detailed descriptive answers.) (16) To what extend were the resources and activities in the ICTPED MOOC useful for your learning? (Applied on a five-point Likert scale.)

The data comprised 310 participants' responses to Q5, Q7 and Q16. All responses were anonymous and voluntary. Mixed methods [11] were applied to analyse the data by providing quantitative and qualitative evidence about participants' engagement in learning. To examine participants' learning in the ICTPED MOOC, responses to Q5 and Q7 were thematically analysed [6; 9]. The participants' responses were imported to NVivo 12 and coded by employing an inductive approach in the thematic analysis [6; 52] without any predetermined categories [39]. To uncover the thematic aspects, the detailed approach was ap-plied, in which all sentences were individually examined with regard to their significance to the phenomenon [52].

The codes identified by the detailed approach were either presented in the form of a descriptive label that provided detailed description or taken from the participants' responses. These codes represented participants' activities and their learning trajectories in the ICTPED MOOC. Thereafter, the codes were put into context with each other to create themes that represent a bigger picture of what is being portrayed [6]. Thus, the single codes from the open coding process were grouped into larger themes to represent patterns of participants' engagement in learning in the ICTPED MOOC. These themes are presented in Findings. Once the themes were identified, they were examined through the analytic lens of P.Y. Galperin's types of orientations to examine how the participants' engagement in learning might have enhanced their transformative digital agency. To ensure the reliability of the results, thematic analysis of the participants' responses was conducted by the research team.

Findings

Quantitative analysis of participants' learning activities in the ICTPED MOOC

The participants' learning in the ICTPED MOOC is analysed by first examining their responses to Q16: *to what extent were the activities in the ICTPED MOOC useful for your learning?* (Tab. 3).

The data show that the majority of pre- and in-service teachers (M = 72.50%, SD = 14.20) found the activities in the ICTPED MOOC very useful. These findings indi-

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Creating a Multimodal text

The main goal of this assignment is to remediate a self-selected monomodal text into a new, multimodal text. The multimodal text should be used as a self-produced teaching resource that provides added pedagogical value in relation to the original text. Use an analogous printed or digital text (monomodal) as a starting point for the remediation. The remediated, multimodal text will be put into a pedagogical context, and you should be able to argue why and how the remediated multimodal text will enhance the development of students' conceptual understanding.

You will need to submit the following three elements, which together constitute the examination assignment:

    1. Original text (file/link)

    2. Remediated, multimodal text (file/link)

    3. Reflection video in which you reflect on the theoretical grounds to justify the chosen modes. In addition, you will need to reflect on the pedagogical value of the remediated text by explaining how the remediated text may enhance the development of students' conceptual understanding.

You may also write a declaration giving other participants the right to use your remediated texts in their teaching practice if they follow the copyright law in the correct manner.

Fig. 2. Examination assignment: Creating a Multimodal Text

Table 3

Participants' responses about the usefulness of the resources and activities in the ICTPED MOOC for their learning

Years	2016	2017	2018	2019	Mean (M)
Totally not useful	0%	2%	0%	0%	M = 0.50% SD = 1.00
Not useful	4.4%	2%	1.2%	0.9%	M = 2.13% SD = 1.59
Somewhat useful	4.4%	2%	2.4%	0%	M = 2.20% SD = 1.80
Useful	33.8%	30%	15.7%	12.1%	M = 22.90% SD = 10.61
Very useful	57.4%	64%	80.7%	87.9%	M = 72.50% SD = 14.20

cate the need to qualitatively examine how the teachers engaged in learning in the ICTPED MOOC.

Qualitative analysis of participants' engagement in learning in the ICTPED MOOC

The qualitative thematic analysis [6; 9] identified several themes that reflect how the participants engaged in learning in the ICTPED MOOC. Estimated using NVivo 12, the percentage coverage of the 'entry' activities is as follows: reading textual information (52.94%), watching videos (21.57%), engaging in assignments (9.80%), listening (7.84%) and other activities (7.86%). The data highlight the differences in the percentage coverage of the entry activities that the participants engaged in during the ICTPED MOOC. In what follows, we examine how the participants engaged in learning in the ICTPED MOOC in detail.

Reading textual information

The majority of participants engaged in learning in the ICTPED MOOC by first reading the textual information embedded in the webpages (Fig. 3)

The participants indicated that they engaged in learning by reading the textual information on the webpages and approached other activities in a different order: some participants watched the videos, took notes, completed the multiple-choice tests and engaged with the assignments. Other participants skimmed the textual information; in doing so, they might have obtained the overview of the target concepts and the structure of the module. Thus, having read the textual information, the participants were able to engage in other activities in the MOOC, utilise the available resources and advance in their learning.

Watching videos

A large group of participants engaged in learning in the ICTPED MOOC through watching videos (Fig. 4).

The participants indicated that they engaged in learning by watching the videos embedded in the ICTPED MOOC. Having watched/listened to the videos, they were able to engage in further activities; therefore, the videos might have been used as entry activities to develop the participants' understanding of the target concepts and how to achieve them.

Engaging in assignments

Several participants indicated that they engaged in learning in the MOOC by first attempting to solve the assignments in the course (Fig. 5).

Several pre- and in-service teachers indicated that the assignments in the module were used as a starting point to engage in learning in the MOOC. In doing so, the assignments might have been used as a lens to develop participants' understanding of the target concepts in the modules, select and utilise the useful resources and engage in other activities needed to solve these assignments.

Listening to the textual information in the module

The participants reported that they engaged in learning by listening to the textual information and videos in the course (Fig. 6).

The participants indicated that they listened to the audio files as support to read the textual information in the module. Other participants first listened to the textual information in the module and then engaged in the activities in the course. By first listening to the audio files, the participants might have created an overview of the content of the course and developed their understanding of the target concepts to engage in further learning in the ICTPED MOOC.

Other activities

Individual participants indicated that they engaged in learning by first collaborating with other students, by attempting multiple-choice tests or by converting the content

I read the information, watched videos, completed the multiple-choice tests and engaged with the tasks.
I first read the information, took notes and engaged with the tasks.
I skim read all pages in the module, then watched the videos, attempted multiple-choice tests and completed the tasks. The structure of the modules is easy to follow. I like that every module finishes with a task that has to be submitted.

Fig. 3. Participants' responses about their engagement in learning through reading

I first watched the videos, read the information and completed the tasks.
I listened to the videos, read the information and solved the multiple-choice tests.
I watched the videos, completed the tasks and, in doing so, got familiar with the software.

Fig. 4. Participants' responses about their engagement in learning through watching videos

I first got familiar with the tasks, then watched the videos, read the textual information and, finally, solved the tasks.
I attempted to solve one task every night. In some cases, two nights were needed to solve complicated tasks. I attempted the tasks first and then read the textual information in the module if it was necessary.

Fig. 5. Participants' responses about engagement in learning through solving assignments

I read and listened to the textual information, then watched the videos, completed the multiple-choice tests and solved the tasks.
I first listened to all the audio files in the module. Then I engaged in other activities in the module.
I read and listened to the textual information, paused and took notes and then engaged with the tasks.

Fig. 6. Participants' responses about engagement in learning through listening to the information in the course

of the MOOC into e-books. These responses do not represent the patterns of participants' engagement in learning; however, by following a detailed approach to the thematic analysis [53], these participants' responses were also analysed and grouped under the theme 'Other activities' (Fig. 7).

In summary, the majority of pre- and in-service teachers engaged in learning in the ICTPED MOOC by reading the textual information and watching the videos embedded in the course. In doing so, the participants followed the progression suggested in the course. However, several pre- and in-service teachers indicated that they preferred to first skim read the content of each module. This might have contributed to creating an overview of the target concepts in the modules, the activities and the assignments they were to engage in. Other participants engaged in learning by familiarising themselves with the assignments and listening to the audio files. Individual participants first engaged in collaborative activities with other participants, converted the resources in the MOOC into an e-book and attempted multiple-choice tests. By pursuing alternative entry activities, the participants created their individual learning trajectories and therefore enacted the design of the ICTPED MOOC.

Discussion

The analyses performed in this study focused on examining the types of activities the pre- and in-service teachers pursued to engage in learning in the ICTPED MOOC and the implications of participants' actions for enhancing their transformative digital agency by addressing the research questions: *how did the pre- and in-service teachers engage in learning in the ICTPED MOOC?* and *how can participants' engagement in learning in the ICTPED MOOC contribute to enhancing their transformative digital agency?*

The patterns of the participants' engagement in learning in the ICTPED MOOC are presented in Tab. 4.

First, the analyses revealed that the majority of pre- and in-service teachers engaged in learning in the ICTPED MOOC by reading textual information in the modules and watching videos embedded in the course. This might potentially indicate the importance of textual and video resources in online courses. Other participants engaged in learning by getting familiar with the assignments and listening to the audio files. Individual participants engaged in learning by collaborating with other participants, attempting the multiple-choice tests and converting the content of the course into other, more convenient formats, such as e-books. From the perspective of P.Y. Galperin's theory, by engaging in these types of entry activities, the participants might have constructed the image of the learning situation in the ICTPED MOOC and revealed the potential of the available resources to engage in further activities in the course. These findings indicate that despite having a suggested sequential progression of the activities in the ICTPED (x)MOOC, participants may not follow this progression and engage in learning through different entry activities to create their individual learning trajectories. Participants' engagement in learning by watching videos, getting familiar with the assignments, listening to the audio files and engaging in other activities might reflect their attempts to develop their understanding about the target concepts and how to achieve them. Such an approach might indicate that to enact the design of the online course, participants are in need of explicit orienting information [20] about the content, target concepts, assignments, the available resources participants might utilise in their learning and the possible learning scenarios.

Second, P.Y. Galperin's types of orientations may serve as a cue to reveal how the pre- and in-service teachers' engagement in learning might have contributed to enhancing their transformative digital agency. From the perspective of P.Y. Galperin's types of orientations, the linear structure of the ICTPED MOOC reflects the complete orientation by offering the sequential progression of the activities that participants are to involve in while revealing the potential of the available resources. Such a sequential progression of activities may serve as step-by-step instructions for participants to advance in their learning. The analyses showed that approximately half of the participants followed the sequential progression offered by the structure of the MOOC. Others who did not follow the linear structure of the module

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I collaborated with other students before engaging in the tasks and multiple-choice tests.
I attempted the multiple-choice tests before I engaged in other activities.
I converted the content of each module into an e-book and transferred it to the iPad before I engaged in further learning.

Fig. 7. Participants' responses about engagement in learning through collaborating, attempting multiple-choice tests and converting the resources into an e-book

Table 4

Participants' engagement in learning in the ICTPED MOOC

Type of activity	Percentage coverage, %	Description
Reading	52.94%	Reading textual information on the webpages and research articles
Watching videos	21.57%	Watching videos embedded in the course
Engaging with assignments	9.80%	Getting familiar with and attempting to solve the assignments
Listening	7.84%	Listening to the audio files of the textual information and the videos in the course
Other activities	7.86%	Collaborating with other students, attempting multiple-choice tests and converting the content of the MOOC into an e-book.

engaged in learning by creating the orientation of the third type: complete and constructed by learners by following a given approach. The entry activity chosen by the learners (watching the videos, engaging with the assignments, listening to the audio files, attempting multiple-choice tests, etc.) may have been used as an approach to construct their orientation to reveal the characteristics of the target concept and engage in further learning. For example, several participants first got familiar with the assignments in the modules and attempted to solve them. Participants' engagement with the assignments might have been used as an approach to develop their understanding of the target concepts and how to achieve them. Developing an understanding of the target concepts and creating an overview of the module might have been achieved by other participants who first listened to the audio files and watched videos and then proceeded to the other activities in the module. The individual participants who preferred to solve the multiple-choice tests, engage in collaborative activities with their peers or convert the available resources into another format might have pursued similar purposes: to create an overview of the course or, in P.Y. Galperin's terms, the image of the learning situation in the MOOC and reveal the potential of the available resources to construct their orientation for engaging in further learning. Such approaches to engage in learning might indicate participants' needs to construct their orientation and reflect the crucial importance of explicit orienting information that indicates what they will learn in the course (target concepts) and how to achieve them (the available resources, the assignments, multiple-choice tests, etc.).

Third, by constructing their unique learning trajectories according to the third type of orientation, the participants might have developed their understanding about how to engage in learning in digital environments. By creating their individual learning paths, the participants enacted the design of the course and therefore affected the epistemic practices in the ICTPED MOOC. However, both groups of participants (who followed the linear progression in the course and who engaged in learning through different entry activities) were able to reveal the potential of the available digital resources and therefore transform their learning by engaging with relevant digital resources; this might have contributed to enhancing their transformative digital agency. Over 90% of the participants expressed their satisfaction with the course in 2016—2019 and found the resources and the activities in the ICTPED MOOC useful.

To summarise, approximately half of the participants followed the structure suggested in the ICTPED MOOC and sequentially engaged in the activities offered in the course. By following such an approach, they might have been able to reveal the potential of the available digital resources, advance in their learning and therefore enhance their transformative digital agency. Other participants, by engaging in the course through different learning activities (watching videos, engaging with the assignments, listening to audio files, attempting multiple-choice tests, etc.) might have developed their understandings about the target concepts and about the learning in digital spaces. These participants might have not only enhanced their transformative digital agency but also affected the embedded epistemic practices in the course.

Implications and directions for further research

There are several pedagogical implications for the design of MOOCs and online courses to facilitate participants' engagement in these courses.

First, the pre- and in-service teachers' engagement in learning in the ICTPED MOOC revealed that despite the linear structure of the course, the participants may not necessarily follow the suggested progression and may engage in learning through different activities in the course. This indicates that the structure of the ICTPED (x)MOOC may offer flexibility for participants to construct their individual learning paths.

Second, and perhaps a more profound implication is that the structure of the online course may affect how participants engage in learning in digital environments. The findings in this study showed that more than half of the participants followed the sequential order of the activities informed by the structure of the course and the remaining half engaged in learning through other activities by creating their individual learning trajectories. In doing so, the participants made their unique contributions to the epistemic practices in the ICTPED MOOC, co-authored and might have contributed to changing these practices. This study, therefore, raises questions about the need for course developers' awareness of how participants may engage in learning in digital environments and the importance of explicit orienting information about the target concepts and how to achieve them. Online courses in which participants can develop their conceptual grasp and understanding about how to go about learning may acquire a new functional significance by becoming a *tool* for studying the *essence of learning and how to go about it*. The pre- and in-service teachers' understanding about how to navigate and propel themselves forward in digital environments might contribute to enhancing their transformative digital agency [7] and, in a broader sense, teacher professionalism in the 21st century [38].

The *third* implication is that P.Y. Galperin's pedagogical theory appeared to be useful to analyse the participants' engagement in learning in the ICTPED MOOC. Such an approach may be employed to examine learning and teaching in digital environments to develop participants' conceptual grasp and enhance their capacity to learn online. Further research may, therefore, examine participants' learning in the digital environments designed according to the orientation of the third type to enhance their learning and capacity in learning to learn. The limitations of this study are that the analyses were based on the pre- and in-service teachers' reflections about their engagement in the ICTPED MOOC. Further research is therefore needed to examine the actual learning process of the participants in online environments.

These findings inform the practitioners, MOOC and online course developers about how participants may engage in learning in digital environments. They also emphasise the importance of awareness about how the design of digital environments may affect participants' engagement in learning and their agentic capacity to learn.

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Обучение в контексте массового открытого онлайн-курса: значение для эпистемических практик и развития трансформирующей цифровой агентности у будущих и работающих учителей в Норвегии

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Настоящее исследование посвящено тому, как участники массового открытого онлайн-курса (МООК) «Информационные и коммуникационные технологии в педагогике», направленного

на повышение профессиональной цифровой компетентности у будущих и уже работающих норвежских учителей, включаются в процесс собственного обучения. Также оно дает представление о том, как характер вовлеченности в обучение влияет на трансформирующую цифровую агентность (transformative digital agency) участников МООК. В своем анализе мы опирались на педагогическую теорию П.Я. Гальперина. Данные включают в себя ответы 310 респондентов на опросник, предъявлявшийся всем будущим и действующим учителям, обучавшимся в рамках МООК с 2016 по 2019 год. Для получения количественной и качественной информации о характере включенности участников курса в обучение были применены комбинированные методы анализа данных. Результаты исследования показывают, что большинство участников выбирали для себя чтение текстовой информации, предлагавшейся в курсе, и тем самым поэтапно продвигались в своем обучении, как это было заложено структурой курса. В то же время некоторые участники выбирали просмотр видео и прослушивание аудиофайлов, содержавшихся в курсе, а также старались выполнять задания и участвовать в иных формах деятельности. Таким образом, участники МООК создавали собственные индивидуальные образовательные траектории, укрепляя свою трансформирующую цифровую агентность и влияя на эпистемические практики, заложенные в курсе.

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"Inner Spring" of Elena Kravtsova:
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This scientific essay focuses on the work and personality of an outstanding psychologist E.E. Kravtsova, who passed away in spring 2020, on the eve of her anniversary. Continuing the work of her grandfather L.S. Vygotsky, she regarded it not as a "family" matter, but as common heritage, where new forms of social practice, primarily educational, emerge.

Keywords: E.E. Kravtsova, L.S. Vygotsky, Cultural-Historical Psychology, zone of proximal development, play, communication, education, developmental learning.

This text was meant to be congratulatory. On April 26, 2020, Doctor of Psychology, professor, devotee of education, Elena Evgen'evna Kravtsova was to celebrate her 70th birthday. Less than a month before the day, on the morning of March, 28 she passed away.

Weren't she L.S. Vygotsky's granddaughter, Elena would not have been a less talented researcher. Yet her talent emerged and developed in the Vygotsky family, to whom we owe not only the preservation, but also the enrichment of Lev Vygostky's legacy. We owe it to them as much as to his immediate disciples, particularly to A.V. Zaporozhets, who became Elena's teacher. And we distinguish between two names: for those of us, who knew her for many years, she was both Lena — a friend, and Elena Evgen'evna — a colleague[1].

Gita L'vovna Vygodskaya, Lev Vygotsky's daughter and Elena's mother, could have easily defended a doctoral thesis based on her brilliant research on psychology of play and research in the field of special education. However, during her lifetime, she preferred to focus on working with her father's legacy, which became the world's psychological heritage largely due to her efforts.

Elena Evgen'evna, the granddaughter, took the next step — she redefined and reconsidered Vygotsky's work in a modern way, reinforced a number of his fundamental, yet not quite disctinctly elaborated notions, bringing together a new generation of researchers. With the onset of the "educational thaw" in the second half of the 1980s — 1990s, alltogether they began to promote the outcomes of this work, introducing them into the practice of education, first — into preschool learning, and later — into school and university. As a matter of fact devotees like this paved the way to the "educational thaw" itself, and many of them were unified by the name of L.Vygotsky and by the ideas of developmental learning, that became accreted to his name.

By the way, Lena strongly disliked it, when her close kinship with Lev Vygotsky was recalled in vain. She even felt a bit awkward. This is not just a matter of Lena's fascinating modesty, which she apparently inherited from Gita Lvovna, who, in her turn, — from Lev Semenovich (spending only 9 years with her father was enough for that). It is just that the right to "inherit a surname" and the right to "inherit a profession" are quite different things. The second one is mainly "obliging", rather than granting privileges.

As far as "the profession" was concerned — the development of Vygotsky's Cultural-Historical Psychology in the 21st century, Elena Kravtsova regarded it not as a "family" thing, but as a matter of the world's science. She viewed contemporary science as capable of "fulfilling itself" in what Lev Vygotsky refferred to as "highly

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[1] Elena Evgen'evna, Elena and Lena are different forms of the same Russian name: full name with a patronomic, full and short forms, correspondingly.

organized practice" — the practice of the development of higher mental functions. She believed that in line with Vygotsky's ideas, science is meant to penetrate into the depths of the "highest", the "uppermost" in a human being, by fully participating in the construction of this kind of practice (more precisely, a family of practices: from educational to clinical). E.E. Kravtsova and her collaborators managed to master many pieces of this most difficult path. This is like climbing a high volcano and step by step descending the crater. But, according to Vygotsky, this is the only possible way to go: the key to the knowledge of the "lowest" lies in the "highest". Thus, Vygotsky himself started from psychology of art, the objectified world of the most complex human experiences, moving towards the emotional world of the child, where the seemingly simple affectations disguise a world equally complex — the one just emerging, not yet shaped. A world, that one needs to discern in the developed (ideal) form of a piece of art.

Many will remember Elena Evgen'evna as an outstanding developmental psychologist, specialist in child psychology, and psychologist of developmental learning. But let us not forget that *general psychology* was thought by L.S. Vygotsky exclusively as *genetic, as a science of development*. All the creative work of E.E. Kravtsova is devoted to that.

The genetic method in psychology (Lena preferred to call it "designing method") is not one of the existing methods in line with many other, but so to speak, a "method of methods". Any substantive conversation about development requires determining its unit — a unit, which Vygotsky coined the zone of proximal development (ZPD). ZPD is not an impersonal set of knowledge, competences, skills or even abilities that a person (child or adult) has to master for successful "socialization". In their own ZPD, they "encounter", first of all, other people, who embody and reveal to them this cultural, common human heritage; they build various relationships with these people, enter into multidimensional communication with them, sometimes very intimate, even if it retains business nature. And in the end, when there is no one around, they encounter ... themselves. But they may fail to make that one «encounter» (on the problematic nature of the ZPD phenomenon, see [3]). In her research, Elena Evgen'evna was able to show that the destiny of "cultural development" (Vygotsky) is determined precisely at this stage — the stage of communication in ZPD. At the same time cultural means of ZPD become the tools that a person employs to master their inner, subjective world, they become the tools of voluntary action. She reduced all that to a simple formula: "cultural behavior is 'arbitrary' behavior", which means that a person *acts voluntarily*, rather than is driven by impulses — either external or, by much more insidious, internal ones.

Mastery of the tools of cultural action, according to E.E. Kravtsova, is not the mastery of its models, but a creative process, where a small child produces such kind of instruments. This process is associated with the development of imagination and with the formation of an "inner position". Due to this reason, as Lena insisted, play is of fundamental importance not only for preschool childhood or even childhood in general, but for the whole human life. It is the accumulator of "the power of imagination." Play — in its full development, undergoes a number of stages, and any attempts to accelerate this process can trigger serious psychological problems in the future [2]. These problems are aggravated by adults, who are supposed to play with children, yet cannot play themselves. Together with her associates Elena Evgenievna practically re-taught adults, teachers and parents of preschool children, to play [1].

It is believed that there are no victories and prizes in children's play (mostly). That is not true: sometimes there are! The main reward granted by life itself is imagination. This is the golden key to the doors of human culture. By opening these doors (remarkably diverse!) a person starts living in human world as a master of their own home. Thus, having the right to continue building it up, to continue "humanifying" it. In science, in art, in everyday activities, in anything one could possibly think of... Surprising oneself and others. Turning life into an event, and one's existence among people — into co-existence with them.

Whereas in learning, adults often seek to surprise exclusively themselves. At one of the conferences Lena said:

"For his 5th birthday, one boy was given a German spinning top with sparks coming out of it. The adults couldn't get enough of it. Only the "hero of the day" was crying. That were not the sparks that he was afraid of. He simply didn't know what to do with the present ... ".

At another conference she came to a sad conclusion:

"There is a society represented by specific adults. And these adults know quite well (or think they do) what the child needs, what he or she does and what does not, what is good and what is bad. And so, the adult pulls the child by the ears, the ears grow, but the child remains the same. "

E.E. Kravtsova and her associates were able to do what, perhaps, no one else managed to. Namely — to build a multi-stage system of developmental learning, covering preschool childhood, primary school age, adolescence, youth, including not only highschool, but university students as well. Within this system, learning processes unfold in the logic of meaningful inter-age communication. As a result, the learning space becomes a sphere of a unique intersection and mutual enrichment of various "zones of proximal development" of all those, who create and master it: children, teachers, parents, psychologists and education managers ...

The educational program "Golden Key", developed by the team of E.E. Kravtsova and G.G. Kravtsov for the very primary — preschool link of this system, has become widely known in Russia and draws the interest of the colleagues from all over the world as an example of bringing L.S. Vygotsky's ideas into practice. A unique model of psychological education at the university level, elaborated by E.E. Kravtsova, is the top, the "crown" of the system. This model has been successfully implemented at the Institute of Psychology of L.S. Vygotsky at RSUH for over 20 years. This model ensured the openness of the

whole system to development within the scope of professional practices (and beyond). After leaving the university, yesterday's students demonstrate their professionalism to such an extent that they are able to continue their learning, rather than simply "apply" what they acquired in class. One cannot imagine a professional psychologist with no intention for further personal development h. Alma mater provided all the conditions to create such intentions. This means that professional position emerges on the basis of the personal one. And that is the whole point of developmental learning.

Indeed, according to E.E. Kravtsova, much more distant, broader, sometimes more unpredictable genetic prospects are maturing in the zone of proximal development. ZPD itself is there at least for the two. As well as the development within it. Whilst people still argue: can (should) an adult develop in the zone of proximal development of a child? Lena smiled when she heard this kind of disputes.

Lena was a "person of communication" in every sense. Communication was "the way of her life and work," and the concept of "communication" was a medium of understanding the nature of both. Sometimes we were willing to argue with her a bit: they say, after all, the reason for communication arises within the activity. And so, we had discussions. What a wonderful form of communication Lena has come up with! A form of communication for psychologists of the country and the world, working in the traditions of the Cultural-Historical Psychology! International Readings in memory of L.S. Vygotsky, annual and each time topic based. The previous discussions

were not finished yet, but the next ones were already in mind. Then at the end, each participant received a beautiful leaflet with an announcement of the subject for the upcoming Readings. What is going to happen to the Readings now? They do have a future — yet, what will it be without Elena?

Today we grieve along with all Russian and world psychology. The name of Vygotsky preserves its significance, as it follows the semantically-meaningful fairway of his ideas, expanded and deepened by E.E. Kravtsova.

We express our condolences to the members of her family, who can rightfully be called the "The Vygotsky-Kravtsovs Psychological House", to numerous students and followers, teachers, inspired by her ideas, and everyone, whose life was once radically changed even just by a single encounter with Elena Evgen'evna. The staff of Moscow State University of Psychology and Education who knew her and loved her, are grieving with us.

On the day of farewell to Lena, after a persistent heat, snow started coming down on Moscow and the Moscow region. Cold and soulless, it fell on the naked orphaned gray Earth, a bereaved "planet of people." But spring is ahead, Lena's spring, and more than one. With or without Lena — it depends on those, who welcome it. Lena did her utmost so that "your inner spring would not deceive you" (Titus Lucretius Carus) — any time of the year.

She created "inner spring" around, adultly explored spring's childish and youthful mysteries and carried this spring within herself. "Inner spring" — that was her "topic" in science, education, life.

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«Внутренняя весна» Елены Кравцовой: слово об ученом и друге

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В жанре научного эссе рассказывается о творчестве и личности выдающегося психолога Е.Е. Кравцовой, которой не стало весной этого года, накануне ее юбилей. Продолжая дело своего деда Л.С. Выготского, она мыслила его не как «семейное», а в сплетении перспектив культурно-исторической психологии, где рождаются новые формы социальной практики, прежде всего, образовательной.

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DISCUSSIONS AND DISCOURSES
ДИСКУССИИ И ДИСКУРСЫ

A Discussion about the Development of Higher Mental Functions in Brazilian Schools: A Portrait of Excluding Inclusion

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This paper aims at providing an overview of Brazilian schools focusing on the development of Vygotsky's concept of Higher Mental Functions (HMF), especially in the case of students with disabilities. We often see that a lack of appropriate teacher education leads to further excluding students and others involved in the teaching-learning processes — such as the educators themselves, who feel increasingly overwhelmed by their classes of 45 to 60 students, shortage of money and governmental investment. We can even say that Brazilian official schools are immersed in a conflicted-conflicting, alienated-alienating and oppressed-oppressive contradictory reality that is increased by this exclusion-inclusion dichotomy that hinders teachers' and students' participation in dialogically organized activities [9; 30; 23]. This diminishes students' possibilities for developing HMF, which require an argumentative, critical language organization not often accessible to students whilst they continue to be educated on the receiving end of a system that is based on principles of assistance, as are the teachers. With this in mind, the text aims at answering the following question: To what extent are HMF pursued in classrooms allowing young people with(out) specific educational needs to develop (as close as possible) to their fullest potential?

Keywords: Higher Mental Functions, children and adolescents with disabilities, specific educational needs, context-bound education.

First words first

This paper aims at discussing the development of Higher Mental Functions (HPF) in their relation to the education of children and adolescents with (or without) specific educational needs or disabilities in impoverished school contexts mostly in the outskirts of a large city (São Paulo) in Brazil. We show that certain circumstances might affect or hinder education, and more specifically the development of HMF, especially in times of the pandemics[1], in a context that encompasses (1) the lack of financial means for families to support their children's distance learning in the current social-educational situation (imposed by COVID-19), for example, and where (2) schools and universities had to interrupt their activities for months in order to search for financial sup-

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[1] We refer to COVID 19 that has been considered a pandemic by the World Health Organization (WHO) that have urged everyone to stay at home in the early months of 2020 – and possibly until mid-2020 at least.

port to try to provide students with computers and internet services for some educational work to be resumed. Nonetheless, in the outskirts of São Paulo, most teachers report not having any contact with 50% to 80% of their students during most of the school year, which initiated in March 2020, a couple of weeks before everyone was instructed to stay at home.

Moreover, lack of information about the pandemic and shady political stances, have led to other complications that affect education: teachers' wages can now be cut down on the premise that if they are not going to school, they should not receive some of the benefits to which they were entitled. However, the decision to cut down on salaries does not take into account that teachers are using their own electricity, paying to upgrade their computer (application) software and to have access to improved internet services in order to work with students. There is no financial benefit from the part of the government for this. Let us clarify that we are speaking of people who sometimes earn between one and two minimum salaries per month[2] for a teaching position of twenty hours per week — which means at least 10 more hours of planning, correcting and marking tasks on a regular week (one that has not been affected by the pandemics). Let us clarify further that the work is greatly increased when everything is carried out by distance learning. And to make matters worse, many (we dare say most) teachers do not know how to use the applications provided on the internet. So, they also need to learn at a rapid pace in order to use them. This may require them to spend some money on crash courses besides the equipment upgrading.

Some teachers, as well as most students attending public schools are in the group 14 million Brazilians that are considered impoverished. These are people that live with less and US$1.9 per day. Some of the students in this group attend school in order to make their daily balanced meal. With the pandemic, they are not receiving this benefit. So studying or purchasing equipment that might enable learning processes is not an option. In fact, there are school principals and teachers who are themselves campaigning to gather food and clothes for households in need. And they take the bags of groceries and clothes from house to house, sometimes entering and preparing the food for the children, cleaning the houses when the parents are unable to do so for reasons of health, disabilities or even drug/alcohol abuse. These teachers and principals are, therefore, putting themselves at risk to help provide for small children who have no one to take care of them. And many times, they are doing so by going into slums, where houses are built so close together that it is a wonder that the pandemic has not affected every individual, the entire community at once[3]. Needless to say, some of these teachers and principals are getting sick.

Bearing this context of social exclusion in mind, it is important to also clarify the general situation of stu-

dents with specific educational needs (SEN) in Brazilian schools. Prior to the quarantine, most students with SEN were already excluded from the classrooms where they ought to have been included — a result of poor teacher education, as we have discussed in many other occasions [3; 4; 5; 6; 7; 29; 28]. This is often due to lack of knowledge from the part of the teacher (or lack of education to work with children/adolescents with additional needs), as the data excerpt below informs:

C5: There is no pedagogical meeting for the design of different activities for students of inclusion[4]. Most meetings are used to discuss bureaucratic stuff: absent students, poor behavior, students that are sick and need to receive activities at home, I mean, there are so many things.. we unfortunately don't have time to adapt the curriculum.

Researcher6: Taking into account the changes in educational context and public policies regarding the process of inclusion and the need for the school to guarantee learning to all students, can you tell me what you think is the teacher's role today?

C6: I mean... I try to do something that is close to adapting the curriculum, but I can see that there is no guidance. We miss something that may help us to understand what inclusive education is about (...). I need to learn before I can be requested to do something.

Researcher7: Have you ever had any teacher education regarding inclusive education that might help you to adapt activities for the students?

C7: No. Never.

Researcher 8: And what about here, at school, any course about that theme?

C8: Not that I remember, no. Except for the talk you gave us. [31, p. 133—134].

With the new world order, the situation of students with SEN has become worse, and to a greater degree because parents do not know how to work with their children when they present additional needs. However, we must clarify that most of the data provided here is not from the current moment of home schooling. We mostly discuss data collected from regular classroom periods, involving interactions between students with special educational needs and teachers, but we base our statement that the learning situation has worsened on interviews and research carried out with parents, in which most have similar statements as the one below:

Mother of boy with intellectual disability: I have to admit that it is a challenge... I mean, I am at home and can support him. If I don't, he won't do anything because he gets distracted really easily. But I don't know what I would do if I had to go out to work everyday and had no one to leave him with or to help him with his homework. I can see that he is improving, slowly, but he is. But, for example, I have a niece who also has intellectual disability and she is not doing anything. Her mother can't help because she has to go work. So she just plays the whole day. It's a school year with no learning.

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[2] The minimum salary in Brazil is currently just under US$184.

[3] For more information on the context referred to in this paper, please refer to Fidalgo [4; 5; 6].

[4] Many educators in Brazil refer to students with specific needs or disabilities as students of inclusion when they attend regular schools.

And teachers' statements, informing that:

I have about 430 students, but I could only contact about 90 in these last 6 months. No matter how much I try, by phone, email, etc., I receive no answer from most of them[5].

After explaining, in a nutshell, the general situation of Brazilian schools and their students, we turn to the questions that we aim to answer here: to what extent are HMF pursued in classrooms allowing young people with and without specific educational needs to develop (as close as possible) to their fullest potential? And how does/should learning take place so as to ensure this development? We begin by discussing the concept of HMF. After that, we discuss the concepts of collaboration and the organization of argumentative texts — showing how they might enable or be linked to the development of higher mental functions. We anticipate that the discussion is likely to be better understood with the examples — data drawn from theses and dissertations that have been completed in graduate programs where we supervise young researchers. And we finish with conclusive remarks, fully aware that it is not by far the end of this discussion.

Higher Mental (or Psychological) Functions

The concept of Higher Mental Functions is one of the most important in Vygotskian work — especially for researchers investigating the teaching-learning processes of people with disabilities. Higher Mental Functions are what makes humans unique as an animal species. One can infer from this that denying people with additional needs the means for developing HMF is denying them at least part of their humanity.

About his studies in this area — which, according to González Rey [12], can be considered the core of the second phase of Vygotsky's work — Vygotsky [37, p. 97] says:

(...) the uniqueness of this process of development of higher forms of behavior that comprises the subject of our research is still inadequately recognized by contemporary psychology. The cultural development of the child, as we have attempted to establish (...), represents a completely new level of child development which not only is still inadequately studied, but usually has not even been singled out in child psychology.

Encompassed in the notion of HMF are such functions as voluntary attention, memory, perception, behavioral control and, more importantly for our studies, language. These functions are socio-culturally and historically developed, i.e., they require socio-cultural-historical relations to take place in order to be developed, and follow a dialectical process: language (speech) as a cultural tool mediates the organization of collaborative

loci that allow for relationships that are socially contextualized to produce cultural experiences through which humans produce meaning of the very experiences that they have and that they enable for others. As González Rey [12, p. 65] puts it, Vygotsky "explicitly presents his idea of higher psychological functions as functions that are regulated by signs that are culturally developed and used for the production of a new type of human behavior (...)." In Vygotsky's own words [35, p. 130], "Just as speech serves as the basis for development, so, too, does the external form of collective collaboration precede the development of a whole series of inner functions".

However, in so-called bilingual classrooms for deaf students learning Portuguese, we find teaching interactions justified with such explanations as:

I2: [...] the work we do is really repetitive, you know? (...)

I21: No, I don't think it is only an activity... I mean, it is an activity, but... it has to be that way, repetitive.... Do you understand? You repeat and repeat in several different ways and...so that they can really internalize that... that word, really, learn how it's written you see? Because I know that they have learned the sign, but writing is difficult.

(...)

I42: (...) it is pointless for me to show them lots of words if they do not know the sign (...) so it is really a repetitive work, something that you have to do day in, day out, you repeat the words, like you repeat their names, every day, because they know their signs... [25, p. 150].

The above excerpt was taken from a Reflective Session [16][6], in which teachers and teacher educators discuss a lesson that was video recorded. As we can see, it was about deaf students and their teacher's interaction. Students were in Primary School. However, the same approach is seen in a High School classroom with deaf students, as the following data exemplifies:

J4: We were continuing from the last class, you see? Because the coursebook brings a number of exercises [...] and I require them to do these. [...]. If they don't, you know??? They need to train, they need training. If they are taking a governmental exam and this content is in the test, something... and they don't know how to do the task... So they have to do the exercise. (...). [28, p. 302].

In such contexts, we can see that the collective collaboration is still dictated, top-down, it is still one in which students will learn how to repeat and copy, and/or learn by translating words from Brazilian Sign Language (Libras) to Portuguese and vice-versa.

However, Vygotsky [37, p. 101] explains that for HMF to be developed, one needs to consider that

Intellectual reaction (...) differs in many essential characteristics of origin and function, cannot be placed in the same order as mechanical formation of habits that arise by trial and error (...)

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[5] The mother and the teacher quoted here have reported their situation during the XVIII Forum in Linguistic Inclusion in Scenarios of Educational Activities; I Colloquium in Social-Educational Inclusion and Teacher Education, II Colloquium Studies in Deaf Identity and Culture and II Colloquium in Inclusion and Accessibility Nucleus — a conference held at the Federal University of São Paulo in Septemberr2020.

[6] Reflective session is moment in teacher education in-service programs in which participant's actions are looked at and challenged.

Thus, according to Vygotsky's work, what makes humans unique are features that they do not have from birth, nor do they develop naturally; features that are constructed within the individual's dialectical interaction with the environment where s/he lives, works, studies, i.e., with his/her communities of practice, considering that

Every higher psychological[7] function occurs twice during the process of behavioral development: first, as a function of collective behavior, as a form of cooperation or cooperative activity, as a means of social accommodation (i.e., on an interpsychological plane) and, again, a second time, as a means of a child's individual behavior, as a means of individual adaptation, as an inner process; that is, on an intrapsychological plane. [36, p. 192].

These are functions that differ from the Elementary Mental Functions as the latter are biologically, organically developed. It does not seem to us that HMF are usually developed by copying, repeating and translating in between languages — the latter being a skill whose pre-requisite is having a lot of intercultural knowledge, and the formers being tasks (i.e., copying and repeating) usually carried out individually rather than collectively.

The HMF are then merged with the person's natural features, converging to form his/her unique sociobiological personality. Again, in Vygotsky´s [34, p. 42] words:

A normal child's socialization is usually fused with the processes of maturation. Both lines of development — natural and cultural — coincide and merge one into the other. Both series of changes converge, mutually penetrating each other to form, in essence, a single series of formative socio-biological influences on the personality. Insofar as physical development takes place in a social setting, it becomes a historically conditioned biological process.

It seems therefore, that by requesting the child and adolescent to endlessly copy, for at least 8 years (from 5th grade — Primary and Mid-School — to 3rd year High School), our educational system is trying to promote the development of HMF as if these were biological, at the tip of the students' fingers.

If we consider that, in the case of our work, that led us to investigate the HMF and write this paper, was Vygotsky's [35] statement that the general principles that lead the development of children with disabilities are the same that guide any human development, we see that there is something terribly incorrect in the classrooms depicted here. The tasks provided to deaf students focus on the disability, focus on the assumption that, if a child or adolescent is deaf, they will only learn Portuguese from repeating, copying and translating

However, a child with disabilities is not simply that, i.e., s/he is not simply *the disability*. Vygotsky [35, p. 123] states that

It is impossible to be guided only by what a given child lacks, by what he is not. On the contrary, it is necessary to have some conception, even if the most vague understanding, of what his capabilities are and what he represents. In this vein the bourgeois school accomplished exceedingly little.

And he claims that the same misguiding idea is used to understand children without disabilities, when he states that

All methods used thus far for studying the behavior of the normal and the abnormal child, regardless of the great variety and differences that exist between them, have one common characteristic that links them in a certain respect. This characteristic is the negative description of the child that results from existing methods. All the methods speak of what the child does not have, what the child lacks in comparison with the adult, and what the abnormal child lacks as compared to the normal child. (...) Such picture tells us nothing about the positive uniqueness the child from the adult or the abnormal child from the normal child. [37, p. 98].

In many Brazilian schools, this statement still holds true, i.e, children are assessed as per what they lack in comparison with the adult. For this reason, sometimes, we will find schools that teach by filling up a board with information or by lecturing as if trying to squeeze as much information inside the child's seemingly "empty" mind:

S17: So, in this lesson, I actually was continuing to explain the content of last class because it's in the 9th grade planning; we have to teach grammar aspects such as subordinate clauses and adverbial subordinate clauses. How was I supposed to do that without reminding them of what an adverb is? (...)

S18: So, I thought of a lecture, you see? With the objective of reteaching them the concept, in a more superficial manner because, in fact, I was just reminding them. (...). [27, p. 299].

Contrary to this teaching methodology, Vygotsky's work seems to show us that to understand the child's capabilities and how children make sense of the world, we need to understand that the general human processes of development are socially derived, and later internalized, and further understand the responsibility that this statement alone poses for the school, the teachers and everyone who works with children and adolescents with(out) additional needs. If, as stated by Vygotsky, the development of higher forms of behavior is the key for the social development of all children, and if social development is achieved in social interactions and engenders psychological advancement, then, the organization of collaborative relationships is also the key to developing HMF, as we discuss next.

Collaborative settings and argumentative language frame: enhancement of HMF

Based on Marxist tradition, Vygotsky sees the role of collaboration as a central element for the construction of loci that may allow shared participation in schools. This is clear, for example, when the author argues that

Only with the increasing socialization of the child's speech and all of the child's experience does development of the child's logic occur. It is interesting to note that in the development of the child's behavior, the genetic role of the

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[7] Same as Higher Mental Functions.

group changes, higher functions of thinking are manifested in the beginning in the group life of children in the form of arguments and only later lead to the development of reflection in the behavior of the child himself. [37, p. 103].

As we can see from the quotation, another fundamental element in Vygotsky's view is language, since it is the blend that enables shared participation and allows reasoning to be revisited and re-signified many times throughout life. However, as the excerpt below shows, for many students who are deaf, the bilingual school — despite its limitations as we have shown here — is the first moment in which they will have contact with any language, i.e., prior to their first day at school, deaf children who are born in hearing families, whose members often do not know Sign Language, will have no contact with a language *per se*[8]. Until then, these children and their families develop some signs (in Brazil, these are called family signs) that will enable them to ask for their basic needs (water, food, having a shower, etc.).

*I34: I think that it is the first language, it is the language in which... in which they will have knowledge of the world. Because they arrive here, and they, especially the children who have never had any contact with the language, with Libras, you see? They live in a world of hearing people, and for them the world has no meaning (...) then they come here, they discover a world, "now **I can communicate**, now I can... now... I have found my language, right?* [25, p. 156].

Since most deaf children in Brazil are born in hearing families who do not know Sign language, and since medically, deafness is still treated as a disease — i.e. it needs to be cured — parents do not learn Sign language even after discovering their child's deafness. They treat the child for the "disease" and, in some cases, force them to speak Portuguese, while, in others, simply rely on the "family signs" created in order to communicate the basics. In both cases, the deaf child is educated to believe that s/he is never going to be able to live a "normal" life. They only realize that this is not true when they go to school and meet other children and adults who are also deaf. Then they begin to socially construct a different idea of themselves and to understand the world differently. "Through others, we become ourselves", says Vygotsky [37, p. 105]. This reinforces the relation between the interpsychological and the intrapsychological planes in the learning-development process, but it also clarifies that "(...) cultural development is based on the use of signs and that including them in the whole system of behavior occurred initially in a social, external form [37, p. 103].

Nonetheless, as the excerpt shows, many teachers see the language that is taught to the deaf child as having solely the function of communicating. This function, i.e., language used for communication, which the hearing child masters at a very early age, the deaf child will begin to learn when they go to school (and if their parents find a bilingual school for them, i.e, one that can teach them Bra-

zilian Sign Language)[9]. Until then, as mentioned earlier, they will have created a few signs that will allow them to request what they need, but most of the communication that takes place in a family will not include the deaf child — for lack of a shared language per se. So, for example, during the pandemics, the child may not even know the reason why s/he is not leaving the house, why no one visits. If s/he has started to attend school, but stopped due to the period of social isolation, s/he many not even know the reason why. Further developments in/with language, such as, for example, the child's ability to negotiate senses and meaning or challenge points of view (i.e., the person's argumentative skills), thus developing critical thought may not be the focus t in the early years[10].

It is decisive that collaborative work is part of the school environment, so as to create a place where everyone feels at ease to discuss themes as broad and ideologically set as the political role played by school agents (the teachers, for example) in decision making moments of theoretical-methodological paths, of school material and the classroom organization itself. In Brazil, since 2016, schools are told to avoid discussions that are ideological because ideology has been considered as synonymous to political party activism. Therefore, many schools, many classrooms are becoming even more dictatorial establishments, i.e., places where there is no room for discussion and difference of opinion, which means no room for the students to learn how to think argumentatively. As a matter of fact, the number of militarized public schools in Brazil had increased 212% by mid-2018.

The school — the environment *par excellence* to create the possibility for the child to access cultural tools, thus developing cognitively — may do so by vertical, and therefore dictatorial, organization, or by a more collaborative environment, i.e. more horizontal decision-making and task distribution, one that will cross fragmented cultural borders of individualism. In both cases, language plays a very important role: in the latter situation, the kind of language that circulates and is taught is argumentative, allowing students to see the pros and cons of each position taken by those that participate in the activity. In the former, language is used to make announcements, not for communication [9], it is used to tell others what to do, how to act; language is a power-related tool and a strong power-enabler.

Brazil has been failing to recognize that this misguiding duality exists both in schools and in school policies. There is still very little work on how children learn; their skills are not taken into account, while their shortcomings are. In other words, their limitations are often pointed out to justify the reason why the children are excluded even within the so-called inclusive school. Therefore, their zone of real development, as well as their often background of scarcity are pivotal to forming an

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[8] School age in Brazil is from 6 to 14 years of age. Some children may go to pre-primary schools, but this is not compulsory.

[9] There are only seven in São Paulo.

[10] In São Paulo, deaf children stay the initial 4—5 years in a Bilingual school — if there is one available and if there are vacancies in this school. Then, they go to a regular school — preferably one with a bilingual classroom, if there is one available. In the latter, they learn Portuguese. It is understood that they will have learnt how to communicate in Sign Language at the end of the fifth school year.

image of the child that will stay with him/her for the rest of their school years. What they could develop within the school, collaboratively and argumentatively is not considered. In this environment, teachers will inevitably feel frustrated — even angry — because they feel (or maybe they were taught to think) that it is their duty to deal with the "problem" they have in the classroom. This is clearly seen from the choice of words used by the teacher in the excerpt below:

*E2: I still think that inclusion is **only seen on paper**. In practice, despite our attempts, this **creature** will be **kept separately**. I may bring specific material to work with him; I may flexibilize the material, and he is being treated differently. I think that inclusion should make him equal to others, and if I have to do something specific, different for him, I am not making him equal. On the contrary, if I do things differently, then he really is excluded like a **vase in the classroom**. (...) even if we try (...) I still think that they **remain excluded** (...) they are still there, in **their own little world**. We don't have the necessary time to give them the necessary attention with these classes with forty students, (...) and the **teacher's role, unfortunately is not only to explain content, but to take care, keep an eye on them, make sure they don't kill themselves**. When I sit to do something different, (...) I have to use at least 20 minutes from my 50-minute lesson with this student... so I have to reduce everything to make him understand in 20 minutes (of which, ten will be used to ask the class for silence: "People, please stop! I'm trying to speak here.") It's complicated. I think that inclusion is a **fallacy**; we have it on paper; we try, but we actually don't have inclusive classes yet.* [31, p. 85].

This considered, one would think that more studies would be taken into account to think of educational policies. This is not the case. Few studies are carried out focusing on how students deal with their specific needs or disabilities, and there is a blatant disregard for these studies from a political point of view. More often than not, there is very little consideration given to the many cultures that congregate in the same classroom. All teaching is provided following a top-down and transmissive perspective, designed for an ideal student and what he/she should be able to accomplish in each given term. Therefore, in a class of 40 non-ideal students, as the one depicted in the excerpt, one would expect a great deal of frustration and a strong dose of disbelief in policies.

The language used mirrors what Gee [11, p. 42] explains when pointing out that the language organization usually seen in schools is one that is "disconnected from the transformations of society and supported by systems based on an authoritarian and pyramidal hierarchy (...)." And we can add that teachers themselves are often dealt with in a pyramidal relationship by policy makers, principals, heads of educational departments, among others. Therefore, the process of shared and collaborative knowledge production, organized in the form of questioning, challenging, negotiating meaning — advocated by Vygotsky, as well as Freire [9] and the followers of his Critical Pedagogy (McLaren, Giroux, Kincheloe, among others) — is denied the student, especially if s/he has ad-

ditional needs. As we could see in the previous excerpt, the teacher sometimes has twenty minutes to talk to the student who has specific needs, and even these might be cut short. Students, therefore, are often granted the right to copy from the board and complete repetitive tasks aimed at educating people who will repeat actions rather than delve in challenging the *status quo,* as well as problem-solving and creative ideas, which would require, according to Freire [10], that schools turn from the narrative by the teacher to the involvement of students in critical actions that challenge unsubstantiated power and seek social justice. They need to regard the students' life stories as stories of possibilities rather than of determination [10]. And in the case of children with additional needs, schools, policy makers, and everyone that is involved in education, need to remember that any disability is "miniscule in comparison with the colossal areas of wealth which handicapped children possess" [33, p. 68].

By the same token, the dialogical approaches of Vygotsky´s late works (1930—1934) and Freire´s critical dialogue (which he considers central for the development of students' critical thinking) stress the key role of argumentation in the organization of classrooms teaching-learning and development. In the classroom, collaborative relationships and argumentative organization of language use enables participants to act so as to place their points of view in relation to what others have said, thus agreeing, disagreeing, expanding ideas, requesting that ideas be expanded to further the understanding. This involves contradiction of senses that have been put forward, since these senses have been socio-historically constituted in and through the several experiences that each individual has lived. Therefore, collaborating requires the creation of cognitive and affective conflicts that are inseparable from each other, leading to the organization of critical dialogues [9] which, in turn, allows for a collaborative process to take place, besides shared internalization, productive interdependency, construction of new and shared meanings that may transform the object under discussion.

One could call this, as does Mateus [24, p. 9], a pedagogy of argumentation, since knowing how to use the argumentative text "broadens the potential for democratic participation when it allows for differences to be openly discussed and positions reviewed." Besides, in these environments, differences (or positions) can also be safely discussed, since the debate is not sought as a means for defeating one's opponents, but for jointly constructing new meaning and knowledge. In other words, even though the teacher (or the principal, the coordinator, the policy maker) may be stronger in the position they occupy, the collaborative environment, contrary to the dictatorial environment, will have to make room for other arguments to be evaluated as more appropriate *as per* the situation discussed.

It is important to emphasize that this critical-collaborative language organization requires the involvement of everyone — the teachers and the students (regardless of age or of the specific needs that they may have). It aims at intentionally listening to and understanding the

senses that are put forward by the others (peers, teachers, anyone), and requesting-providing clarification before another point of view is presented. In Bakhtinian terms, this was called responsive listening. Participants must listen attentively so as to probe into words with a view to clarifying them and thus, better collaboratively constructing the meaning/knowledge under discussion. As a coordinator of the whole teaching-learning process, the teacher, rather than providing answers, will (even with students from very early ages) pose questions that are organized to request clarification and argumentative support — which could be presented in the form of theories that support the meaning being constructed, or explanations, examples (any of the known forms of support in an argumentative text). Liberali [14], discussing Adam and Bonhomme's [1] forms of argumentation, concludes that one may also provide arguments by describing something and by telling a story, which will evidently differ in the textual organization.

In other words, "the concept of collaboration has always a critical co-participation focus, since it is organized by means of a dialectical process that shapes participants' relationships through the argumentative language [19, p. 5].

It is thus our premise that a collaborative language organization, achieved by means of argumentation, may create interdependent cognitive and affective conflicts that allow for shared internalization of the object being discussed, with a view to developing a collective and transforming view of this object. John-Steiner [13, p. 188] illustrates the key importance of collaboration for knowledge production when stating that: «Through collaboration we can transcend the constraints of biology, of time, of habit, and achieve a fuller self, beyond the limitations and the talents of the isolated individual.»

Along the same lines, the work carried out by Magalhães and followers [8, 17; 18; 19; 15; 20; 21; 22; 26], in the last 30 years highlights the understanding that collaboration is a process, placing activities (in this case, activities carried out in schools) under constant review and requiring participants to work together so as to comprehend and transform the world whilst transforming themselves in the world, both the specific and the broader collective contexts in which they are involved (including the transformation of society *per se*), i.e., collaborative work is constant, it is a co-construction of the world, and one that requires a language organization.

However, collaboration requires that teachers also be collaboratively educated. The excerpt below exemplifies this. It is data collected in a reflective session. Questions asked here allow the teacher to clarify what she is doing. They also should allow the teacher and the teacher educator to create an atmosphere in which the teacher can confront her senses about teaching, education, her students. The teacher educator (here also the researcher) cannot be the ole knowledge producer and provider. So, challenging what is said is a process leads to confronta-

tion of senses whilst avoiding the researcher from taking a top-down position.

N[11]3: *I am very anxious all the time. I want to see results quickly. I would like to be different, but perhaps because* **I have been just like them,** *I try not to raise a lot of barriers between us, do you see?*

S4: *What do you mean…* **why do you think you have been like them?**

N4: ***POOR!*** *Just like them because…(…) there are some colleagues that think they are superior and don't get involved with the children. And this … this makes me… a little…I try to… I may make mistakes because I think that sometimes* **I am not playing my role as a teacher***. Sometimes, I am a mother and I think this may jeopardize teaching. I think I should keep a bit more of a distance, but I can't. So, I think this is where I am wrong. I wish I could improve.*

S5: *But…. if you* **think of the lesson that you taught…** *the one I recorded, in which moments do you think you did not act as a teacher? Or, in other words… **what do you consider to be the roles of a teacher?***

N5: *Ah! Moments in which I see that a child did not do her homework (…) I call them, I talk to them and I ask them what is happening. I talk to each one, do you see? I try to raise their awareness. I would like to bring them to the coordinator's room, but then… I think: "talking to them might be better."*

(…)

N8: *I could have used the book, right? And then, I think… "Am I right?"*

S9: *So, again**… in order to answer this question, we need to go back to that question about roles***. What role does the course book have for you? When you say "I could have used the book" but decided not to. When you say that you decided to ask them to create their own math's problems, why are you in doubt about acting correctly?* **Do you think that the book is sovereign?** [20, p. 335—336].

As the dialogue shows, it is a matter of going back and forth in one's knowledge construction process. So, it may take a few extra turns for the questions to be raised again. We believe that by teaching about collaboration and argumentative reasoning, we are educating teachers. However, by using collaborative tools and argumentative reasoning with them (in the teacher educator's meetings and programs) we are modelling what this rather difficult organization can be employed. Both moments are important to allow teachers to go from a repetitive, top-down, transmissive lesson organization to one that might allow students to exercise their critical thinking and thus critically develop their HMF, regardless of whether they have students with or without specific needs in their classrooms. After all, the data discussed here shows that they are educating all students to solve exercises, but not problems, to repeat tasks, but not think about the roles that these tasks have in their education. And when a teacher uses a little bit of creativity — as does the mathematics teacher above — she feels guilty that she is not conforming.

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[11] N is a Mathematics teacher; S is Sueli Fidalgo.

In lieu of conclusion

We aimed, in this text, to discuss, albeit briefly, the concept of Higher Mental/Psychological Functions, more specifically that of language, in its relation to concepts such as collaboration and argumentation. We also aimed at looking at school practices and the language used in school environments, discussing the extent to which this may allow for HMF to be developed. We argue that if we want children to go beyond the practices of repetition, and to have the possibility of social inclusion, it is necessary that these children be educated within a collaborative, argumentative perspective, one in which language is not taught with a view to simply allowing for communication to take place, but also to analyze, asses practices, negotiate senses/meanings, resignify points of view, supporting ones ideas and taking into account those of others. Unfortunately, data shows that this type of linguistic practice is rarely seen in the Brazilian school environment today. We do, however, remain truthful and strongly supportive of education because it is our strong belief that even if education alone does not transform the world, without education, there is no change at all [9].

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К вопросу о развитии высших психических функций в школах Бразилии: портрет изолирующей инклюзии

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В статье представлен обзор бразильских школ с точки зрения их роли в развитии высших психических функций у учеников, в особенности у учащихся с ОВЗ. Очень часто мы видим, что отсутствие

качественного образования у педагогов приводит к эксклюзии детей и других участников образовательного процесса, в том числе самих педагогов, которые ощущают постоянную перегрузку, работая в классах по 45—60 человек, в условиях систематического недофинансирования сферы образования. Можно даже сказать, что государственные школы Бразилии перманентно погружены в противоречивую реальность, одновременно и раздираемую конфликтами, и порождающую их, отчужденную и отчуждающую, угнетенную и угнетающую; и дихотомия «эксклюзия/инклюзия» лишь усиливает эти противоречия, препятствуя диалогическому выстраиванию деятельности педагогов и учеников. Подобная ситуация мешает полноценному развитию высших психических функций, для которого важна дискуссионная, критическая языковая организация, зачастую недоступная ученикам, пока их продолжают обучать по системе передачи знаний, как когда-то и их учителей. Принимая во внимание все вышесказанное, в данной статье мы постарались ответить на вопрос: в какой же степени современная бразильская школа способствует развитию ВПФ и позволяет как здоровым ученикам, так и детям с ОВЗ раскрывать свой потенциал настолько полно, насколько это возможно?

Ключевые слова: высшие психические функции, дети и подростки с ОВЗ, специальные образовательные потребности, контекстно-зависимое образование.

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