



## The Role of Zone of Proximate Development in Interactive Assessment of Intellectual Development

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### Authors' contributions

*This work was carried out in collaboration between two authors. Author YS designed the study, wrote the protocol and supervised the work. Author LQ carried out all laboratories work and performed the statistical analysis. Authors YS and LQ together managed the analyses of the study. Author YS wrote the first draft of the manuscript. Both authors managed the literature searches and edited the manuscript. Both authors read and approved the final manuscript.*

### Article Information

DOI: 10.9734/BJESBS/2016/22408

#### Editor(s):

- (1) Shao-I Chiu, Taipei College of Maritime Technology of Center for General Education, Taiwan.
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- (3) Anonymous, University of Lisbon, Portugal.

Complete Peer review History: <http://sciencedomain.org/review-history/12790>

Original Research Article

Received 30<sup>th</sup> September 2015  
Accepted 11<sup>th</sup> December 2015  
Published 25<sup>th</sup> December 2015

### ABSTRACT

The process of intellectual ontogenetic development has been studied by many prominent psychologists. However, there are few works, which consider the zone of proximate development during assessment of intellectual development. The present study is an attempt of elaboration and application of such procedure to children who live in different social and economic conditions. 1120 Mexican school children of both sexes from different levels of living (rural, suburban, lower urban and higher urban) were selected. The age of children was from 6 to 12 years. Each socio-economic group consisted of 280 children: 20 children from each school grade. The Scheme of Evaluation of Intellectual Development was elaborated and applied to all children. The Scheme represents the evaluation of the zone of proximate development as the plan of fulfilment of the experimental task after presentation of orientation base of action. The Scheme consists of two intellectual tasks, which are presented in different plans of intellectual development: verbal, images or actions. The results showed impossibility of execution of the initial task. The analyses of variance pointed out significant

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difference between the groups. However, after the orientation base of action has been provided, the majority of children who had failed in the initial task was able to realise it on different levels. Significant difference was found only for levels of helping during presentation of orientation base of action. These results show the ability of children from all groups to work in the zone of proximate development and realise the intellectual task after previous orientation. According to our study children are able to achieve verbal level, which indicate existence of broad zone of proximate development. The discussion is based on the paper of the zone of proximate development and of the orientation base of action given by adult.

*Keywords: Zone of proximal development; intellectual development; assessment of development; qualitative assessment; historical and cultural psychology.*

## 1. INTRODUCTION

The process of intellectual ontogenetic development and the ways for its evaluation have been studied by many prominent psychologists from the point of view of diverse paradigms such as Piaget [1], Wallon [2], Galperin [3]. It is clear that the assessment of intellectual development implies the concept of human intellect and possibility of its development is always related to one or another paradigm. Within different proposals for study and assessment of intellectual development it is possible to identify two general tendencies: assessment of intellectual development as if it were a kind of specific abilities or a sum of diverse abilities and as a process, which include different kinds of actions with objects. The first tendency uses frequently quantitative psychometric IQ like procedures. The second tendency uses qualitative or even interventional experiments [4,5,6]. It is also possible to consider that two particular lines might be identified in these tendencies: 1) consideration of functional (quantitative) development and 2) interest of development by stages or forms (qualitative intellectual development) [7]. In that case, quantitative or functional tendency would test independent present or current actions or concepts of the child, while the second tendency would prefer to research on the process of qualitative developmental changes within intellectual activity. This second tendency is mostly related to the paradigm of historic and cultural development during ontogenetic long process defended by Vigotsky's followers [8]. Development of intellectual actions, from such conception, takes place within cooperation and collaboration between adult and child [9] and never in a spontaneous way and related only to chronological changes. Both understanding and assessment of intellectual development may be satisfactory accomplished only in situations of

collaboration and mutual participation of adult and child.

It is interesting to note that even within the line of functional development not only refers to enrichment of the content of child's thinking or assimilation of new intellectual operations [10,11,12]. It is possible to notice gradual interiorization of these actions [13,14]. According to some authors [7], changes in the content of intellect are being carried out together with the reorganisation of types of intellect. The important characteristic of the line of child's intellectual qualitative development is appearance of new forms of intellectual activity. Psychometric procedures of testing do not take into account such qualitative changes or possibility to fulfil same task on different level of development: material, materialized, perceptual and verbal [15,6].

According to the theory of formation of intellectual actions by stages, these forms or stages of intellectual development are: the stage of concrete actions, the stage of concrete images and the stage of logical-verbal intellect [7,16,17]. On the stage of concrete actions a child operates with real objects. On the stage of concrete images a child operates with representations of objects. On the stage of logical-verbal intellect a child operates with systems of symbols, signs and words on linguistic level. The appearance of a new stage of intellectual actions does not mean disappearance of the previous, like in Piaget's theory [10]. All stages co-exist together after the stage of concrete intellectual actions and continue to be useful during life of each individual within human culture [6]. The essential point for assessment of development is the fact that concrete actions are first to appear during preschool age. Later one, perceptive intellectual actions become to be accessible for children. At the end of preschool age, some new intellectual actions become to be accessible at verbal level.

In order to obtain clear picture of development, it is useful the presentation of same intellectual action on different levels in case of difficulties with verbal or perceptual level [18].

Within historic and cultural conception of development, an important characteristic of intellectual development is the zone of proximate development proposed by [19]. The zone of proximate development refers to what the child is able to do in cooperation with the adult or older child, in other words, receiving the orientation and help from the adult. The whole path of intellectual development follows the logic of collaborative, external and social actions and, only later, as a result of interiorization, intellectual actions achieve level of inner, individual and ideal plan [15]. Intellectual actions with concepts and logic characteristics and operations may be fulfilled correctly from the very beginning, starting from the level of material actions. All new actions the child fulfils inside collaborative cooperation, based on proposed orientation from external world: offered by an adult.

On the contrary, the zone of actual development shows only the actions and knowledge, which the child is able to imply by him/herself. In other words, these actions are not new to the child and he/she can fulfil them without any external help correctly. This psychological concept is broadly known and many psychologists of all over the world use it [20,21,22,23]. However, there are still few works, which consider the zone of proximate development in the procedure of assessment of intellectual development in children [24,18,25,26].

The existence of the two lines means within intellectual development means that it is necessary to create methods for diagnostic of both lines: functional development and development by stages or levels [26]. At the same time the existence of two zones of development (actual and proximal development) refers to the necessity of taking the decision of what zone is the psychologist going to follow during assessment procedure.

In general it is possible to identify three main approximation to the diagnostic of intellectual development: 1) traditional approximation based on psychometric tests and the estimation of IQ; 2) psychogenetic approximation with Piaget methods and 3) assessment within collaboration with a child as an approximation elaborated in historic cultural of [27,28]. The first approximation

evaluates functional or quantitative line of intellectual development in the zone of actual development, in other words, the child receives no helping from the experimenter [29]. Such ways of evaluation of the level of intellectual development of children are being strongly criticised by many modern authors [30,31]. The second approximation tries to establish qualitative changes in the intellect of a child, but the child has to solve all the proposed tasks independently, that is, the evaluation takes place also in the zone of actual development.

Another non-traditional situation could be observed with the third approximation. Psychologists who follow Vigotsky have accomplished the most significant attempts on the way of introducing of the zone of proximate development in the process of evaluation [32]. That means that psychologist evaluates the tasks, in which the child is able to fulfil with his help and not independently. In this case the psychologist has to find other different tasks, which are new for the child. After that, the special orientation (external help) has to be presented to the child. Finally, experimenter can verify the child's ability to solve the problem by him/herself.

From this point of view the evaluation of intellectual development means to determine at what stage a child can realise the new task and/or at what stage he or she can accept the orientation of the adult [33]. The orientation is presented in form of the scheme of orientation base of action, which reflects the essence of the task [34,35]. That means that psychologist shows all necessary information, which make it possible to solve the problem. The mentioned orientation could be provided in different volume (step by step) according to the operations, which conform the action [25]. The participation in the task together with the orientation of adult implies the inclusion of the zone of proximate development in the process of evaluation.

The purpose of the present study is to show how the concept of the zone of proximate development could be used during diagnostic of intellectual development of children by stages of concrete actions, concrete images and verbal thinking. In this study, by the zone of proximate development we mean the possibility of realization of new intellectual tasks proposed by an adult after orientation. Orientation is an essential part of external help proposed by an adult during assessment [36]. The assessment and evaluation is based on formation of gradual

steps by presentation of external orientation for helping the child in fulfilment of the new intellectual task. According to this proposal the zone of proximate development will be assessed by a possibility of a child to accept external help (orientation) and to collaborate together with an adult.

## **2. METHODS**

### **2.1 Subjects**

1120 children of both sexes from primary schools of the State of Puebla (Mexico) were selected and divided in four groups according to their social level: rural, suburban lower urban higher urban (private schools). 280 children were evaluated in each group: 10 children (5 boys and 5 girls) in all school grades. The age of children was from 5 to 12 years old, which include the pre-scholars and all six grades from primary school. All children were regular pupils with average school marks of 7 at school (according to system of 1 to 10 for school marks). No kinds of clinical or pedagogical difficulties were detected with the children. In rural and suburban group, children came from families where parents were peasants, workers or employed for temporary poorly paid tasks. In urban group the fathers of the children were employed for small enterprises. In private group fathers and mother were employed or professionals. The majority of mothers in all groups were housekeepers. In all groups children were pupils of school, in which traditional official methods for school learning were used according to programs of the Secretary of Public education of Mexico. Experimental, innovative or alternative schools were not included in the study. The level of education of teachers corresponded to technical level for preparation of teachers of Normal School: 3 years of preparation at Pedagogical Colleges for teachers of primary schools and for level of preschool education. Nearly all children showed expressively genuine interest and positive motivation during proposed experiments and cooperated during the work with orientation.

The Table 1 shows the distribution of the participants of the study according to school grade, social group and gender.

### **2.2 Materials**

The Scheme for Evaluation of Intellectual Development [25] was applied during the study.

This scheme was based on the methods of qualitative assessment, which suppose mutual collaboration between adult and child. The concept of the zone of proximate development includes two main aspects: 1) the stage on which a child acts after the orientation or receives this orientation and 2) the volume (incomplete or complete) of this orientation given by experimenter. The stage of external orientation is an essential part of this assessment: there is no way to present a new intellectual action without previously shared orientation. The orientation is given only to children who were not able to fulfil new presented task by own means.

This scheme does not evaluate current level of child's knowledge, that is, does not deal with the functional line of his/her intellectual development. The main goal of the scheme is to evaluate qualitative characteristics, which determine the stage of child's intellectual development. The basic principle of such qualitative assessment is formation of new intellectual actions (skills, abilities), which didn't exist in the child before [9]. Before evaluation of the form (stage) of intellect, experimenter explains to the child the whole procedure of the problem. In this case experimenter works in the zone of the child's proximate development. It means that the results of the evaluation actually reflect the qualities of the whole intellect and not the degree of formation of some concrete actions [33].

### **2.3 Procedure**

Initially, experimenter shows geometrical figures and colours, which are being used during the evaluation and asks if the child knows them. After that, experimenter verifies if the child is able or not to fulfil the initial task. If the child solves the problem, the conclusion is that this task is not new for him/her. If the child fails, the scheme of orientation base of action is provided after which the stage of intellect in the zone of proximate development can be determined.

After presentation of the orientation base of action, experimenter verifies the level of child's potential development. If the child answers correctly on verbal level, the experiment concludes and the level on the answer is verbal. The same thing takes place with the level of images and of concrete actions. The orientation base of action permits us to see if the child can rich a higher level after its presentation of the lowest stage (concrete actions).

**Table 1. Characteristics of the participants from different socio-cultural levels by sex and age (in years)**

	Grade	Age								
		5	6	7	8	9	10	11	12	
Rural group	1	31	9							40
	2	1	21	16	2					40
	3			17	20	2	1			40
	4			1	18	16	3	1	1	40
	5				1	19	20			40
	6					2	19	14	5	40
	7							23	17	40
Suburban group		32	30	34	41	39	43	38	23	280
	1	31	9							40
	2	1	18	20	1					40
	3		1	21	12	5	1			40
	4			1	22	14	2	1		40
	5					23	13	4		40
	6						17	18	5	40
Urban group	7							16	24	40
		32	28	42	35	42	33	39	29	280
	1	22	18							40
	2		24	16						40
	3			19	21					40
	4				19	20	1			40
	5					16	22	2		40
Private group	6					1	18	20	1	40
	7							15	25	40
		22	42	35	40	37	41	37	26	280
	1	17	21	2						40
	2		12	27	1					40
	3			18	21	1				40
	4				17	22	1			40
	5				1	20	18	1		40
	6					2	14	23	1	40
	7						1	18	21	40
		17	33	47	40	45	34	42	22	280

The level on which the child fulfils intellectual action after presentation of the orientation base of action with one of its levels of helping points out potential zone of its intellectual development was chosen. That means that the child is able to work on this stage with the orientation base of action. The zone of proximate development is determined according to the stage of fulfilment of the new task (concrete actions, concrete images or verbal) and to the level of helping during orientation.

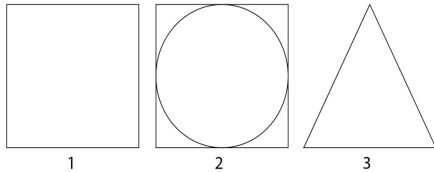
In the first experiment the orientation base of action is applied on the level of concrete actions. In the second experiment the scheme of orientation base of action is given gradually in different levels: verbal level, level of concrete images and level of concrete actions. During the presentation of the orientation base of action

experimenter shows all steps of the task gradually and explains to the child who it should be solved. The stage of the orientation base of action finishes when the child manages to solve the problem independently. There were no limits for number of repetitions or explanations of this stage and no limits for time of working on this stage. Both experiments took approximately one hour time for each child individually.

### **2.3.1 First experiment**

Experimenter puts the figures in front of the child (square, square with circle and triangle) (Example 1). He asks the child to find the fourth figure that has to be different from the third one in the same way as the second figure is different from the first one. If the child answers correctly, experimenter presents it two similar tasks on

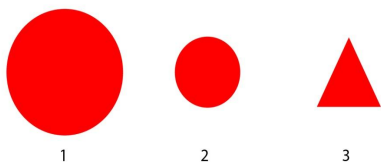
verbal level. If the answer is correct, the child finishes its participation in the first experiment. If the child makes a mistake in one of the tasks, experimenter presents the orientation base of action. In this experiment the orientation base of action is always presented at material level, after which the verification of independent execution takes place on verbal, perceptive or material level.



**Example 1. First experiment**

**2.3.2 Second experiment**

Experimenter puts the figures in front of the child (big red circle, small red square and small red triangle) (Example 2). He asks the child to form one group of two figures excluding one of the figures. The task consists of finding one similar characteristic in two figures and excluding the one, which does not have such a characteristic. If the child answers correctly, experimenter presents him/her two similar tasks on verbal level. If the child answers correctly, he/she concludes her/his participation in the second experiment. If the child's answer is incorrect in one of the tasks, experimenter presents the orientation base of action. If the child's answer is still incorrect, experimenter presents the orientation base of action on the level of images. After that, the child receives two similar tasks on the level on images. If the child answers correctly, his/her participation in the second experiment concludes. But if the child's answer is incorrect in one of these tasks, experimenter presents the orientation base of action on the level of concrete actions. After that he/she receives two similar tasks with which the participation in the experiment concludes.



**Example 2. Second experiment**

**2.4 Orientation Base of Action**

The purpose of orientation base of action is to verify if the child is able to fulfil the tasks after its presentation. The orientation of base of action implies the presentation of the essence of the tasks and the ways of it's solution. The correct solution depends on the fulfilment of actions, which conform the task. The orientation can be complete or incomplete. The volume of orientation depends on the necessity of a child. The consecutive explanation of the operations of each task represents the steps of orientation base of action.

In the first experiment the orientation base of action is applied in the form of concrete actions. The task of the first experiment consists of finding of the fourth figure that has to be different from the third one in the same way as the second figure is different from the first one. This action represents three consecutive operations: 1) to notice the difference between the first and the second figures; 2) to find the base for the last figure and 3) to complete the fourth figure by adding the essential element of the second figure.

In the second experiment the orientation base of action presents initially on verbal level without showing real figures. The task of the second experiment consists of finding of the difference and similarity in the three figures and exclusion of one of them by forming a group of two figures. This action represents three consecutive operations: 1) to find the characteristics of the figures; 2) to find the difference between one figure and other two and 3) to exclude one of the figures by. If the child doesn't solve the problem after verbal orientation, he/she receives orientation of the level of images. If the child fails also on this level, concrete actions are used. So, in this experiment, procedure of presenting of orientation is consecutive: form the verbal level to the level of concrete actions.

After presentation of the orientation base of action, experimenter verifies the level on which the child is able to fulfil the tasks after he/she received the orientation. Such level will determine the zone of proximate development in one of qualitative levels of intellectual development. If the child answers correctly on verbal level, the experiment concludes and this level determines the zone of proximate development of this child. The same thing occurs with the level of images and of concrete actions.

If the child's answer is incorrect on the level of concrete actions, we consider that this task inaccessible and could not be related to the zone of proximate development of the child.

The level on which the child fulfils intellectual action after presentation of the orientation base of action points out his/her zone of proximate development for this kind of intellectual activity. The same thing occurs in relation to the level on which the child accedes to the scheme of orientation base of action presented by experimenter. That means that the child is able to work on this level of intellectual development with the help of the scheme of orientation base of action.

### 3. RESULTS

The results obtained in both experiments indicate impossibility for the fulfilment of the initial task in all socio-cultural groups (Table 2). That means that the presented tasks were new to the children from all groups and were not related to their zone of actual development.

However, after presentation of the orientation base of action the results were quite different. The majority of children, who couldn't fulfil the initial task managed to do it on one of the levels in each experiment (verbal level, level of

concrete images or level of concrete actions). Such results were observed in all socio-cultural groups in both experiments. The Table 3 shows results obtained during first experiment, while the Table 4 shows results of the second experiment. The most interesting date is that the percentage of fulfilment of verbal level is very high in all socio-cultural groups and not only in private. The minority of children in all groups fulfilled the proposed tasks on the level of concrete actions.

The differences between executions of boys and girls were not founded. The statistic analysis pointed out significant differences only for steps of helping during presentation of orientation base of action at the level of  $P = < 0.000$ . Table 5 show these results obtained in the first experiment and the Table 6 shows it for the second experiment.

According to these results the children from the private group in more cases needed incomplete steps of helping during orientation. These steps are related to the first or the first and the second operations of corresponding intellectual task. The majority of children from rural and suburban groups needed complete orientation or all three operations to accomplish with the proposed task. At the same time the majority of children from all groups needed complete help or all three operations to succeed with the tasks.

**Table 2. Percentage of subjects with incorrect answer in the initial task**

Experiment	Groups			
	Rural	Suburban	Urban	Private
1	82.14%	74.64%	64.64%	71.42%
2	65.35%	62.50%	52.85%	46.42%

**Table 3. Percentage of subjects with correct answer after orientation**

**Experiment 1**

Level	Groups			
	Rural	Suburban	Urban	Private
Verbal	62.17%	61.27%	75.30%	77.95%
Images	19.17%	23.69%	17.28%	15.05%
Actions	18.65%	15.02%	7.40%	6.98%

**Table 4. Percentage of subjects with correct answer after orientation**

**Experiment 2**

Levels	Groups			
	Rural	Suburban	Urban	Private
Verbal	48.00%	56.80%	59.58%	66.14%
Images	33.71%	33.72%	30.13%	25.98%
Actions	18.28%	9.46%	10.27%	7.87%

**Table 5. Steps of orientation**

**Experiment 1**

Steps of orientation	Groups			
	Rural	Suburban	Urban	Private
1	7.25%	2.31%	16.66%	25.80%
2	34.19%	26.58%	25.92%	28.49%
3	58.56%	71.09%	57.40%	45.69%

**Table 6. Steps of orientation**

**Experiment 2**

Steps of orientation	Groups			
	Rural	Suburban	Urban	Private
1	2.28%	3.55%	8.90%	16.53%
2	16.00%	10.05%	10.95%	18.89%
3	81.71%	86.39%	80.13%	64.56%

**5. DISCUSSION**

The main finding of our work was, majority of children from all groups were not able to fulfil initial task (before orientation). At the same time, children from all groups could manage with the new task after given orientation. We stress that important condition for fulfilment of the task is not social background of a child but the possibility to accept new external orientation and collaborate with an adult.

However, some differences between socio-cultural groups were observed during fulfilment of the initial task in both experiments. Rural group presents the highest level of impossibility of fulfilment of the initial task. This means that the biggest percentage of rural children were not able to fulfil initial task before orientation stage. We also find in this group the highest percentage of children who weren't able to fulfil the task after the presentation of the orientation base of action. Such differences are observed in the zone of actual development [21,37,38,39]. The presentation of orientation conducted to successful fulfilment of the task by the children from all groups. The fulfilment of verbal level is fairly high (more than 50%) in all groups.

It is possible to conclude that the work in the zone of proximate development with the help of orientation base of action permits to fulfil the task in one of the levels of intellectual development. This statement is true for the children of all groups and doesn't depend on the child's initial level. It means that the zone of proximate development is broad in all groups and depends

on the effects of the scheme of orientation base of action presented by an adult.

We would like to stress that the majority of proposals for assessment consider only current and initial level and never take into account potential possibilities of children. IQ like tests evaluate, in best cases, actual development or memorized knowledge but never the zone of proximate development [4,40,41]. School learning and teaching instructions should be taken into account for assessment, as it is shown in recent publications [42]. Traditional proposals of assessment by psychometric testing never consider collaboration, but only possibility to fulfil the task independently [43]. Even new constructivist publications related to assessment of intellect development consider only independent possibility of fulfilling the tasks of test [10]. In such cases, only zone of actual development might be measured.

All broadly known tests of intellect and development finishes just where we started: when we see that the child cannot fulfil the task, we procedure to the stage of orientation. After orientation, we may evaluate the own ability of a child for realization of new intellectual similar task. The presentation of orientation might be understood as an appropriate cooperation between adult and child, in which the adult is an organizer and promoter of child's cognition. In last publications in was shown that human cognition is a social determined process, which takes from the early childhood and depends on profound communication cooperation [44,45]. Our results show that not only social



communication, but also specific kinds of orientations should be taken into account. Our results may be compared with well known opinions of researchers who show critical attitude in relation to IQ measuring [46]. Gardner expresses similar point of view [47,48]. This author proposes to consider intellectual development as a more open like, interactive and creative process. Schalock [49] is another author who defends the necessity of consideration of social context and adaptation during assessment and treatment of children with intellectual retardation. Quality of life is included as an important aspect during assessment [50]. Our research follows similar position, but the difference is that the proposed orientation as an essential element of the zone of proximal development permits to obtain positive results while working with new intellectual tasks. We may suppose that better positive perspective for intellectual development might be taken into account as another element of quality of life.

Such results are impossible to obtain if the orientation base is not used during evaluation. Such is the situation of all psychometric standard methods of psychological evaluation. The evaluation without orientation always shows great differences between groups belonged to different educational and socio-cultural levels. On the contrary, the usage of orientation helps to determine the zone of proximate development of the child, which is always broader than the zone of actual development. The zone of proximate development depends on the methods of orientation and helping applied by an adult [33,25]. The more effective are these methods, the less notable are socio-cultural differences between the children. Considering that such differences are always unfavourable for groups of low socio-cultural and economic levels, the evaluation of potential intellectual development becomes more significant. In our study significant difference was found only for steps of helping during presentation of orientation base of action: the higher the socio-cultural group, the more incomplete is the step of helping; the lower the socio-cultural groups, the more complete the step of helping during orientation. These data means that the main difference between children from different socio-cultural levels is related to the quantity of help and orientation which he/she needs for solution of intellectual problems.

The results of the study shows that it is possible to work with children with different social background: rural and urban. The possibility of a

child to learn does not depend on social background but on the possibility to accept new external orientation and collaborate with an adult. The methods of school learning in Mexico do not consider the importance of any kind of orientation. In the majority of school situations children have to repeat, memorize and answer within no orientation or explanation of what they have to do and how. The last point is the most important: proper orientation always shows not only what we have to do, but also how to manage it. Vigotsky always meant that the zone of proximate development is a potential possibility and collaboration with another participant of learning process [9]. Such a way of consideration of the essence of development, that is, historical and cultural nature of intellectual development, may be broadly used in the process of pedagogical and clinical research [36,51]. It gives a therapist and the teacher a new qualitative possibility; the possibility to provide useful orientation instead of traditional questioning, repetition and memorization of tasks.

The findings of the study might be useful for school psychologists, specialists in psychological developmental and difficulties in school learning and teacher of different levels. The usage of the zone of proximate development permits to establish equal parameters of children's intellectual development for children from different social groups. Such parameters depend on quality of acquisition of cultural experience during the process of education [52,53,35]. The quality of acquisition depends on kinds of external orientation, which might be present or absent in child's life. According to the concept of orientation in psychology [13] and from the point of view of psychological structure of psychological activity, orientation-investigative activity is one of the basic elements of the process of teaching and learning. We claim that the success of future education depends on the way, how new orientation is presented and not only on proper current level of each child.

## 6. CONCLUSIONS

The results of our study have proved that the zone of proximate development may be used during interactive assessment of the stage of intellectual development. New intellectual tasks should be used during such an assessment. The ability to work with presented orientation is a parameter of zone of proximate development related to intellectual actions. The work in the

zone of proximate development with the help of orientation base of action permits to fulfil the task in one of the levels of intellectual development. The main differences between socio-cultural groups were observed during fulfilment of the initial task and on the volume of presented orientation. After presented orientation the children from all social groups were able to fulfil new intellectual task. Such a type of cooperative evaluation of intellectual development not only marks the differences between socio-cultural groups like many other studies do. The work in the zone of proximate development shows the ways and strategies, which lead to gradual disappearance of such differences and positive intellectual development of children. Our findings can be useful for organization both of interventional assessment and ways for psychological and pedagogical improvement of learning difficulties.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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