

## **Working With Mother-Infant Dyads For Inducing A Consecutiveness Notion In Young Children**

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**ABSTRACT:** *Contrasting with a Piagetian tradition, Vygotsky's broader project of inquiry focused on the genesis of human mind and how mind is made possible through mediation founded on symbol-use in social interaction. Specifically, human mind should be understood as a semiotic organization regulated in its concrete socio-cultural context. In this paper, it is held that Vygotsky's Zone of Proximal Development notion connects this general statement with a pedagogical perspective on education. Findings related to mothers working with their children with the purpose of inducing a consecutiveness notion are examined here. It is concluded that adults providing contingent regulations promote children's intellectual development for the construction of complex notions such as consecutiveness even in very young children.*

**KEYWORDS:** *Mother-Infant Interactions, Consecutiveness, Zone of Proximal Development, Mediated Learning, Vygotsky*

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Date of Submission: 09-08-208

Date of acceptance: 24-08-2018

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### **I. INTRODUCTION**

During the current century, the study of mind has called several theoretical perspectives, which, inside their own perimeters, have delimited different ways of understanding mind. Concretely, theories of human development present different views of the role played by social-cultural dimension in cognitive growth. Three orientations are outstanding: the piagetian project, the human processing information approach and the vygotskian or socio-cultural perspective. The three approaches led to very different understanding of mind and, most important, implied a different notion about how mind should be developed or cultivated. In fact, all perspectives recognize the importance of social interactive processes to some extent, but only the latter attribute to them an essential explanatory role. The socio-cultural approach, define mind as a semiotic organization with a socio-cultural genesis. The socio-semiotic analysis is not a secondary component, but of the theory's axis, since distinctive feature of higher mental functions is their property of being semiotically mediated. In Vygotsky's analysis, the primary function of language is the communicative function, and mediational tools are shaped according to communicative demands. Ultimately, he used semiotic analysis to study mediation and regulation of human action (Medina Liberty, 2007; Valsiner, 2014).

This paper, precisely, explores the social dimension of learning through the working with mother-infant dyads. The Vygotskian zone of proximal development notion is applied in order to transfer a consecutiveness notion from mothers to their infants.

### **II. ZPD AND MEDIATED LEARNING**

Vygotsky considered formal education as essential to cognitive growth. In fact, mental activity is uniquely human because it is the product of social learning and of the internalization of culture, which occurs importantly through education. As he says: "Human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (1978, p.88). This statement brings us to one of Vygotsky's central ideas: The famous notion of zone of proximal development (ZPD). Vygotsky introduced this notion during the late 30's, but in spite of the theoretical and practical importance of this concept, it was just recently that attention was given to it (Roberts, 2016; Minson, Hammer & Veresov, 2016; Leonardo, 2017). It has to do with the instruction given to a child by adults or more experienced peers who frame, select, and arrange the environment in a way that generates a potential development incapable for the child to reach if acting independently. Precisely, this potential growth was named by Vygotsky as zone of proximal development. In his own words, the ZPD is "the distance between the actual developmental level 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" (1978, p.86).

The notion of ZPD has oriented many recent studies related to education (cf. Daniels, Cole & Wertsch, 2007; Wass, Harland & Mercer, 2011). Their interest has centered on the role adults play in fostering children's development. In general, a given problem-solving task is chosen that surpasses actual children's cognitive

capabilities so that adults may facilitate or conduct children's efforts toward a solution. This is accomplished because adults are attempting to regulate children's activities. Later, the child alone succeeds in the task, and this means that he does all the necessary operations by himself. When the child self-regulates his or her cognitive processes, he or she can function as an independent cognitive agent (Beebe, 2010; Paley, 2012).

It is important to point out that interactions are not conceptualized as independent functions of either adults or children but as dyadic units based on varying levels of adults' regulations in conjunction with children's activities.

In Vygotsky's perspective, education, correlated with development, must anticipate the latter, it must run ahead as the adults helps the child to reach the next step. It is through such interactions that children can "begin to use the same forms of behavior in relation to themselves that others initially used in relation to them. Children master the social forms of behavior and transfer these forms to themselves" (Vygotsky, 1978, p.57).

Many authors have argued that the issues of how children develop the abilities to plan, regulate, and reflect on their own actions are of capital interest in understanding the ontogenesis of mental functions such as memory and problem solving (Rogoff, 2003; John-Steiner, 2007; Korepanova & Saphonova, 2011; Wass & Golding, 2014; Labarrere & Félix, 2016). Most of the research in this area has been centered on children aged between five and ten years old. There are few cases where participants were younger children Degoratdi, Torr, & Cross, (2008), for example, studied how parents' beliefs about their 12- to 24-month-old infants' minds constitute an important environmental factor affecting children's development. Another research conducted by Paavola et al., (2006), focused on patterns of communicative behavior among mothers and 10-month-old first-born infants. They found that maternal sensitivity was associated with general activity in communication as well as the frequency of responses, while infant co-operation was associated with the frequency of intentional communicative acts.

This study is concerned with the possibility of inducing a principle such as consecutiveness in very young children in collaboration with their mothers. Just as Wertsch, et al. (1980) conceptualized the truck puzzle; we will focus on how this notion is undertaken in a type of "social system" which performs an essential role in the young child's life: the adult-child interaction.

Although young children's comprehension of a principle such as consecutiveness is important in itself, the main goal of this study was the description of mother-infant interactions, and the possibility of a systematization of such interactions for instructional purposes. Based on previous studies (Wertsch et al., 1980; Hedegaard, 2007; Zuckerman, 2007) it was hypothesized that mothers modulate their interventions within a dyad taking into account their child's responses. In other words, mothers "adapt" their behavior to child's performance.

### **III. METHOD**

#### **Participants**

To contact mothers willing to participate in the study, we approached an upper middle-class institution that attended young children in early education programs, From 30 mothers that were initially invited, the sample was finally constituted with fourteen mothers and their child's. Dyads were divided randomly into two groups of seven dyads each based on the type of intervention. These groups will be referred to as the "natural interactions" (N.I.) and the "planned interactions" (P.I.), both are described below. All the children were males and came from upper middle-class families living in the same neighborhood of Mexico City. The mean age of children was 2 to 2.6 in both groups.

Each mother was asked to participate with her child in a study of "mother-child interaction". The mothers and the institution preferred to remain in the anonymity. They were told that the aim of the study was to describe ways by which young children communicate with their mothers under specific tasks.

### **IV. MATERIALS**

A set of six gray cardboard screens was specially designed. The set contained six screens decreasing in size measures: The biggest was 10 in. high and 13 in. long; the next one was reduced 1.5 in. horizontally and vertically and each of the other screens was likewise reduced in size.

The set was attached to a thin tube with small hinges to allows children pull each screen up easily. Also, we used three dolls (a clown, a cowboy, and a samurai) 6 in. tall which were systematically hidden behind the screens. The dolls were purchased in bright colors and numerous details to motivate search behavior.

#### **Procedure**

The data collection took place in the living rooms of the subjects' homes. We wanted mother-child dyads to develop in their natural settings. Each home provided a familiar testing environment.

### **Pre-interaction session.**

A pre-interaction session was carried out to assure that children understood the "game." For this purpose, we used three 14 in. high cardboard boxes each one of different color (brown, red and blue). The experimenter put a toy car inside one of the boxes and then "shuffled" them. All this happened in front of the mother and the child. The instruction given to the child was: "This is just like a game. I am going to hide this car in one of these boxes and then I'm going to move them. You have to tell me in what box the car is." The child was encouraged to make as many questions as he wanted. This session was done to assure that the child had a searching behavior.

### **Interaction Sessions.**

On each session we brought a 24 in. high table to place the screens. The infant was seated in front of the screen set on a chair the same size of the table, with the mother seated behind the screens and the child in front of her. Although the sessions were videotaped, an observer remained during sessions and helped mothers if necessary.

The interaction sessions were conducted under two dyad conditions. In the "natural interactions" (N I), mothers were simply instructed to "try to induce a consecutiveness notion in their child. That is, the child had to seek the doll behind the first screen; then the doll would be hidden behind the second screen and the child had to look for it again and so forth." No specific procedure was suggested; the instruction was simply "to do their best." An attempt was considered as correct when the child searched behind four screens successively. The purpose of this condition was to analyze and describe mother-infant interactions in order to design a systematic intervention plan to induce consecutiveness more efficiently if possible. Precisely, this planned intervention constituted the "planned interactions." Mothers received a brief introduction to the zone of proximal development concept and were instructed to use explicit instructional techniques extracted and systematized from the best interventions developed in N.I. conditions. Specifically, the systematic use of screen's size reduction as an empirical indicator and the combination of speech and gestures to increase gradually the child's comprehension of the working principle. Additionally, a brief recommendation was made: "If the child makes a correct movement, reduce your helping interventions; if he makes mistakes, increase your orienting actions." According to the types of intervention further described, this instruction was implied mainly in types four and five.

According to the searching task analysis and coinciding with Wood and Middleton (1975), five main types of mother intervention were observed, from least to more explicit:

Type 1. General verbal guide. The mother tries to call the child's attention toward a general goal. For example, she might say: "I'm going to hide this doll behind one screen. Can you tell where it is?"

Type 2. Specific verbal guide. The mother describes some specific action for searching behavior. For example: "We have here six screens. I'm going to hide the doll behind one screen but I'll put it behind a different screen each time. I'll do that six times and I'll begin again."

Type 3. General verbal indications plus gestures. The mother states instructions making emphasis by using gestures. For example, "You searched here before (she pointed to a screen). Can You guess where the doll is now?"

Type 4. Specific verbal indications, gestures and feedback. The mother provides specific verbal indications and also uses gestures. For example, "If You looked behind these two screens (she points the screens) just a minute ago, Don't You think that the doll must be elsewhere? Perhaps You should look behind one of those three? (She points again).

Type 5. Mother demonstrates the correct search sequence and provides feedback. She explains using speech and gestures the pattern for guessing where the doll is going to be in the next attempt. Mothers used screens reduction in size as an indicator that emphasized where the doll was going to be in the next attempt. For example, "If I hid the doll here before, the next time I'll put it here (she pointed to a shorter screen), and here for the next time (she pointed again to a shorter screen). Do You understand? Can You guess where the doll is going to be the next time?"

It was considered that a child had acquired the principle of consecutiveness when he completed four attempts successively.

An intervention was initiated when the mother tried to guide her child by speech, gestures or both toward the searching behavior. An attempt or episode can be completed in one of two ways: when the child succeeds uncovering four consecutive screens or when committing a mistake uncovering the wrong screen.

## **V. RESULTS**

There were two main goals of this study. One was to describe the specific relationships developed between mothers and their children. The second, derived from the analysis of these interactions, was the design of a systematic dyad regulation to improve the child's performance.

Table 1 contains the most relevant data. The first two columns describe data related to "natural interactions"; the second two columns describe data of "planned interactions." In columns NI-1 and NI-2 number of mother interventions are listed. In columns E1 and E2 number of episodes required by the child to grasp a consecutiveness notion are also listed.

Two main conclusions can be obtained from the data showed above. First, there are significant correlations between number of mother interventions (NI-1 and NI-2) and number of attempts required by children to understand a consecutiveness principle (E1 and E2). This means that mothers somehow "adapt" their instructional activity to children's efforts. If children committed mistakes or showed some difficulties mothers increased their interventions; but when children performed efficiently mothers moderated their help.

Measures of the mothers' interventions and the number of children's attempts showed significant correlations (NI-1 and E1,  $r = .9559$   $p < .001$ ; NI-2 and E2,  $r = .9710$   $p < .001$ ; Pearson product-moment correlation). This adaptation of mothers' interventions means that they are "pulling" children's performance beyond their actual capacities or independent actions. In other words, mothers in the N.I. condition were working inside a zone of proximal development without knowing the technical concept. They acted intuitively. In the P.I. condition, mothers acted within a systematic instructional program and the results, as can be seen in table 1, are impressive.

**Table 1. Data describing interactions in terms of number of mother interventions and number of children's necessary attempts for acquiring a consecutiveness notion.**

Natural Interactions		Planned Interactions	
Mother interventions	Number of attempts	Mother interventions	Number of attempts
NI-1	E-1	NI-2	E2
35	38	21	25
32	35	17	19
25	29	18	21
31	32	15	17
26	27	21	23
33	37	14	17
31	34	16	18

As can be seen in Table 1, in the N.I. situation, mothers tended to intervene more frequently, both verbally and by gestures but their interventions were applied randomly. This led the child to an erratic performance forcing him to commit significantly more mistakes than children working within a P.I. condition. The second conclusion has to do with differences between both conditions. The difference between mothers' number of interventions (NI-1 and NI-2) is significant,  $t = 7.65$   $p < .001$ . The difference between number of necessary attempts (E1 and E2) was also significant,  $t = 6.78$   $p < .001$ . The fact that children in P.I. conditions committed fewer errors, undoubtedly shows that a planned instructional interaction leads to a better performance. Children in N.I. situations also attained the consecutiveness principle but it took them significantly more time and effort.

This is an important result for it suggests that mothers directed their attention and actions toward children's potential capabilities even if they are not familiar with the ZPD concept. Mothers under the P.I. condition, on the other hand, showed a significantly improved performance since they needed less interventions and their children needed a significantly reduced number of attempts in order to attain a consecutiveness principle. Without this results, it might have been argued that any mother intervention within the zone of proximal development could be determined by some general knowledge, special attention given or even personality characteristics. This study, however, shows that findings were due to mothers' attempts to adapt their interventions to children's actual and potential capabilities. The frequency of mothers' types of intervention and the number of children's correct attempts were also analyzed.

Under the N.I. condition, although mothers used types 4 and 5, they concentrated on types 2 and 3. This means that they were trying to induce consecutiveness based more on a repeating strategy rather than thinking of a heuristic strategy. This happened because in general mothers began their interventions demonstrating the principle (type 5), but since children failed to attain it during their first attempts, mothers then tried some other intervention types (mainly 2 and 3 as was said). They switched their interventions from type to type in a rather unsystematic way. However, as interactions developed and children began to show a better performance, mothers abandoned types 2 and 3 and concentrated on types 4 and 5.

This explains why children's correct attempts were unsystematically spread along almost five types of interventions (the exception under both conditions was type 1 which was used only at the beginning of sessions). Under the P.I. condition, on the other hand, the instructions given to mothers had two positive effects. First, mothers developed their helping actions according to a sequence, as was suggested. The intervention types

described before, imply a gradual assisted sequence from the least and simple actions to more explicit and complex helping actions. Mothers were told to modulate their interventions relating them to children's progress. The interactions which developed this way, allowed mothers to act more directly within children's actual and potential capabilities.

The second effect was on children's attempts. Children's correct attempts increase steadily from type 2 to 5. This means that they really were responding to their mothers guiding indications. That is, more often than not mother's instructions were well used by children. From an overall perspective, the P.I. group showed a much better performance.

## VI. CONCLUSION

The present study showed how very young children are capable to understand a principle such as consecutiveness when they are interacting with their mothers. Naturally, they grasped consecutiveness not as a logical or an epistemological notion but as a pragmatic principle. That is, as a principle working in a familiar context and as a game shared with their mothers. They didn't acquire a conceptual notion but they were able to comprehend and apply a searching behavior pattern for hidden objects. It would have taken children a considerably more time and effort to grasp this principle by themselves. This was possible because children worked in collaborative dyads with adults which pulled them to a potential development.

Planned and non-planned interaction dyads were described in order to show how mothers and their children reciprocally organized and adapted their interactions to attain jointly a goal. The optimization effect of planned dyads was also demonstrated confirming previous findings (Wood & Middleton, 1975; Wertsch et al., 1980). The natural interaction condition showed that mothers regulated their helping intervention according to their children's progress, but this process was slow, with wrong beginnings and misguided directions. Mothers were surprisingly intuitive but they lacked of a systematic instructional method. Their interventions, however random or unsystematic, were the base for the design of an organized interaction procedure: The planned interaction conditions. These planned interactions provided a significantly higher proportion of correct and systematic guiding instructions. Consequently, children mastered the consecutiveness principle through a more efficient way and much sooner than children under natural dyads.

This study showed the effects of accurate tutoring. If the mother-or the instructor-is sensitive to child's progress and adapts her interventions to it, instruction becomes not only more effective but also permits the children to develop his/her potential capabilities.

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Adrián Medina Liberty "Working With Mother-Infant Dyads for Inducing a Consecutiveness Notion in Young Children ." *International Journal of Humanities and Social Science Invention(IJHSSI)*, vol. 07, no. 8, 2018, pp. 67-72.