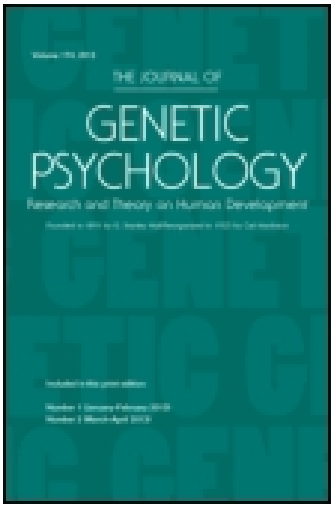


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# Intentional Teaching Facilitates Young Children's Comprehension and Use of a Symbolic Object

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# Intentional Teaching Facilitates Young Children's Comprehension and Use of a Symbolic Object

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ABSTRACT. Children are exposed to symbolic objects that they have to learn to use very early in life. The authors' aim was to examine whether it is possible to intentionally teach young children the symbolic function of an object. They employed a search task in which children had to use a map to find a toy. Experiment 1 revealed that with no instruction 3-year-, 10-month-old children were quite successful; 3-year-, 6-month-olds showed a divided performance; and 3-year-, 0-month-olds failed. With this baseline, Experiment 2 compared the performance of 3-year-, 0-month-olds in three different conditions: no-instruction, complete instruction (before the task begins), and teaching (complete instruction plus corrective feedback); only children in the teaching condition succeeded. However, children 6 months younger, 2-year-, 6-month-olds, failed despite teaching that was provided (Study 3). This research shows that at some points in development instruction is not enough; intentional teaching in communicative contexts is the mechanism that boosts symbolic understanding in early childhood.

***Keywords*** *corrective feedback, contingent information, instruction, intentional teaching, symbolic objects*

Symbolic objects, such as pictures, drawings, and replicas, have a strong presence in our everyday life. Understanding them requires grasping their dual nature, as they are objects in their own right and at the same time representations of something else (DeLoache, 1995). Besides, as almost anything can serve as a symbol or a referent, one important aspect that mediates symbolic comprehension is recognizing the referential intent of the user (DeLoache, 2004; Tomasello, 1999).

Children are exposed to a variety of symbolic objects that they have to learn to use very early in life; but, how do they come to grasp the symbolic nature of these objects? While numerous studies have centered on the developmental basis and different factors affecting children's understanding of symbolic objects, the issue of whether their comprehension is shaped by direct intentional teaching has not been addressed.

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The aim of the present research was to examine whether we could teach young children the symbolic function of an object (in this case, a simple map). We conceive teaching as an instruction that is purposeful, thoughtful, and deliberate (Department of Education, Employment and Workplace Relations, 2009). It means that the adult act with specific goals in mind for children's learning. In this research intentional teaching consisted in providing exhaustive instructions and corrective feedback in the form of contingent information and action demonstrations upon failure. We propose that corrective feedback is a powerful mechanism that optimizes the learning process and contributes to make explicit the communicative intention of the adult.

Undoubtedly, children learn from adults by unguided observation and overhearing, but whenever they are directly targeted by social cues their pattern of learning changes fundamentally (Leekman, Solomon, & Teoh, 2010). Csibra and Geregely (2009, 2011) stated that the presence of these cues acts as an interpretation switch directing young children to construe others' referential knowledge manifestations as teaching events. They proposed that humans are adapted to acquire knowledge from the pedagogical approaches of others. In this sense, communicative contexts may help children to orient toward an adult for instruction interpreting that he or she intends to teach them new information. Young children are skilled at recognizing opportunities to learn from other people and they appear to have expectations for information conveyed along with referential cues (O'Doherty et al., 2011). As Nelson (1986) pointed out, children are sensitive to typical components of social scripts and in the absence of expected components they may fail to recognize a learning opportunity.

Research has investigated the role of adult instruction in children's comprehension and use symbolic objects by examining the kind and amount of instruction children need at certain points in development (DeLoache, 1989; DeLoache, Peralta, & Anderson, 1999; Peralta & Salsa, 2003; Salsa & Peralta, 2007; Troseth, 2003). This research used search tasks in which the localization of a hidden toy was provided by a symbolic object. However, the question concerning the possibility of intentionally teaching the symbolic function of an object has not been addressed.

In these studies, the amount of information was varied in complete, minimal, and no instruction. The instructions were provided before starting the task. Complete instructions consisted of exhaustive information concerning symbol–object correspondences and the intended function of the symbol (to be a source of information to find the hidden object) plus constant remainders before each new search.

Minimal instruction consisted mainly in withdrawing constant remainders. The no instruction treatment was aimed toward capturing children's spontaneous symbolic comprehension. Results showed an age-related decrease in the amount of instruction children require to infer that the information obtained from the symbolic object could be used to find a hidden object in the actual room. The kind of information provided stressed either the symbol–object correspondences or the intended function of the symbol (Salsa & Peralta, 2007). Results showed that although both kind of information had powerful effects, intentionality was the privileged path toward symbolic understanding.

In the present research, we sought to go a step further by examining whether young children could learn the symbolic function of an object. For this purpose, we designed a communicative context, in which the experimenter not only gave complete instructions about the symbol–referent relationship before the task (as typically) but also corrective feedback when the child failed the first search. Corrective feedback consisted in providing contingent information concerning symbol–referent correspondence and the intended function of the map in the task as well as

action demonstrations. We reasoned that when adults instruct young children in everyday social interactions, they use direct intentional teaching in the form of explanations, corrections and contingent information-social cues that constitute powerful mechanisms in the transmission of knowledge and skills (Csbira & Gergely, 2009, 2011; Tomasello, 1999). As O'Doherty et al. (2011) proposed, these mechanisms invite to read the scenario as a pedagogical situation and, as children have expectations of how learning situations are like, they are likely to learn in contexts that match their expectations.

In the present work, we employed a small-scale map, which is a map of a space that can be totally observed in a single look (Uttal, 2005). First, we developmentally explored children's spontaneous comprehension of this particular map. Then, we addressed the main question this study poses, regarding the possibility of teaching young children the symbolic function of the map.



Not much is known concerning the input young children receive in their daily experiences in map understanding, or in the understanding of symbolic objects in general. It is possible, however, that exposure to maps and other symbolic objects is much less pervasive and more variable from one individual to an other than the exposure to other symbolic systems like language and mathematics (Newcombe & Huttenlocher, 2003). In addition, map skills are not intentionally taught during the very first years of life, neither at home nor at school. In this sense, Liben and Downs (1989) proposed that map use constitutes a powerful tool in the study of early symbolic development. As far as research on the understanding of maps by young children concerns, in a pioneering study Bluestein and Acredolo (1979) found that 4-year-old children succeeded in a search task in which they had to use a map that represented a room. Later, Marzolf and DeLoache (1994) and Dalke (1998) showed that younger children, 3 years old, successfully used a map to find a hidden object. The discrepancies in the results concerning the age at which children comprehended the map-space relationship were probably due to important differences in the maps employed. In Marzolf and DeLoache's study the objects used as hiding places were clearly distinctive in shape and color (e.g., a green floor pillow, a red basket), as were the corresponding colored outline shapes on the map. In Dalke's study, the figures on the map were all rectangles with the same color as the real objects; so, even though the shape was not a clue, the color may have helped the children's performance. On the other hand, the hiding places used by Bluestein and Acredolo were identical green boxes, as were the figures depicted on the map. This means that, to be successful, children had to use relational information to determine which box was the correct one. As research has demonstrated, it is much easier for young children to make element-to-element correspondence than to use relational information in mapping tasks (Gentner, 1989). Thus, a mapping task that is facilitated by perceptual similarity and not only dependent on spatial relationships is likely to be easier.

Taken together, the studies discussed previously show that by 3 years of age children begin to understand the representational quality simple maps have in search tasks. In all studies, children were given complete instructions about the map–room relationship at the beginning of the task. In none of these studies were the children corrected and explicitly taught after they failed, as the purpose of the research consisted mainly in investigating developmental differences and not instruction.

To understand the impact of intentional teaching on young children's comprehension of the symbolic function of an object, we conducted three experiments that employed a search task in which children had to find a toy hidden in a small room using a map. The map consisted of an

aerial view of the room. The different objects of the room were represented by black outlined geometric shapes drawn on white paper.

In Experiment 1, we explored at what age children do not need any instructions at all (no instruction) to comprehend the symbolic function of a map by comparing the performance of three groups of 3-year-olds: 3 years 0 months (3;0), 3 years 6 months (3;6), and 3 years 10 months (3;10). In Experiment 2, we compared the performance of three groups of 3;0-year-old-children by varying the informational support provided: no instruction, complete instruction and teaching (complete instruction plus corrective feedback). Finally, in Experiment 3, we investigated the impact of teaching at an earlier age comparing the performance of 2;6-year-old and 3;0-year-old children in the teaching task.

The prediction was that 3;0-year-old children would not understand the symbolic function of the map on their own, but older children would. However, if explicitly taught, 3;0-year-olds would succeed, but 2;6-year-olds would not.



## EXPERIMENT 1

Experiment 1 was designed to determine at what age young children recognize and use the symbolic function of the map on their own. For this purpose, we compared the performance of 3;0, 3;6, and 3;10-year-old children in a no instruction search task in which children had to find a toy hidden in a small room using a map. With this study, we intended to establish a base line to test our main hypothesis concerning the impact of teaching on young children's symbolic understanding.

## METHOD

### Participants

Forty-five 3-year-old children equally divided in three age groups participated in this study; fifteen 3;0-year-olds (35–37 months old, $M = 36$ months, 4 days, $SD = 0.83$ months), fifteen 3;6-year-olds (41–43 months old, $M = 41.8$ months, $SD = 1.03$ months), and fifteen 3;10-year-olds (45–47 months old, $M = 45.53$ months, $SD = 1.18$ months).

In this study, as well as in those detailed in the following sections, the participants were recruited through the day-care centers they attended. The day-care centers were all private and were located in the downtown area of Rosario, a large city of Argentina. Parental informed consent was obtained in advance for all children. The sample was middle class. Most parents had received postsecondary school education or had completed university degrees; they either worked in their professions or in commercial activities. Most of these families had two working parents, and some mothers were housewives. This information was obtained by interviewing the parents. No participants were eliminated from the analysis.

### Materials

We used a small space that resembled a furnished bedroom (95 cm width $\times$ 80 cm depth $\times$ 80 cm height), a black and white map of the room, and a little toy to be hidden (a frog). The room was

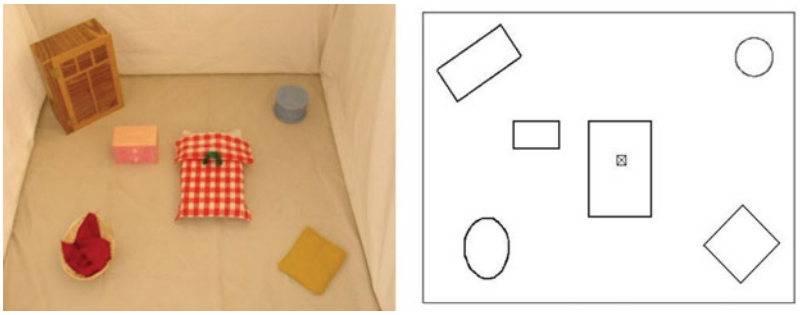

FIGURE 1 Hiding space and its map.



constructed with white fabric supported by plastic pipes with an open front so that the contents were accessible to the child. It contained several items of furniture scaled to the size of the space: a bed, a box, a closet, a basket, a night table, and a floor pillow. The map (21 × 29 cm) consisted of an aerial view of the space; the objects were represented by black-outlined figures of their contours on a white piece of paper. The map's figures were drawn on scale maintaining the same spatial arrangement as the objects of the room. We also used a sticker with a cross to mark the hiding location. Figure 1 shows the materials employed.

## Procedure

This study employed a no instruction condition. The session lasted approximately 15 min and started with a brief warm-up to allow the child become comfortable. Afterwards, the experimenter presented the toy to be hidden and oriented the child to the room and its furnishings, saying, "This is the frog and this is the frog's house; this is her bed, this is her closet . . . " naming all the items of furniture in the room. Then, she introduced the map, saying, "This is a picture of the frog's house, this is her bed, this is her closet. . . . " naming each figure of the map. Finally, she simply announced that they were going to play a hide-and-seek game saying that she was going to hide the toy somewhere in the room and the child had to find it. At no time the experimenter mentioned map-room correspondences or the intended use of the map as a source of information concerning the location of the hidden toy.

The task consisted of six object-retrieval trials with a different location each. The hiding locations were: under the bed, in the box, in the light table, under the floor pillow, in the closet, and in the basket. In each trial, the researcher hid the toy (the child did not watch the hiding action) and then pointed at the hiding location on the map and asked the child to find the toy saying, "I have hidden the frog here (pasting a sticker with a cross on the hiding location), go find it." If the child failed in the first search attempt of each trial the experimenter retrieved the toy saying, "I guess the frog is over here," and no feedback was provided.

## Scoring

In this experiment, and in the following ones, participants were credited with an errorless retrieval if they found the toy or pointed at the correct location in the first attempt. The absence of response

was scored as incorrect. The children were also classified as successful or unsuccessful based on their individual performance. Participants were categorized as successful if they had an errorless retrieval score of 67% or higher (at least four of six trials correct). Although percentages are primarily used throughout the text to facilitate comprehension and comparison with other studies, the number of errorless retrievals was used for all statistical analyses. Preliminary analyses of the data of the three experiments revealed no significant effects involving gender; therefore, we analyzed the data collapsing the gender variable.

## RESULTS AND DISCUSSION

Results show that 3;0-year-old-children found the toy on the first search in 29% of the six trials ($M = 1.73$, $SD = 1.48$). At 3;6 years of age, the percentage of correct retrievals was 51% ($M = 3.07$, $SD = 1.90$). This age group, however, showed a divided performance with seven children achieving 79% correct retrievals ($M = 3.07$, $SD = 1.90$), and eight children achieving 27% correct retrievals ($M = 2.93$, $SD = 1.90$). At 3;10 years of age, the percentage of correct retrievals reached 85% ($M = 5.00$, $SD = 1.13$; Figure 2).

A one-way analysis of variance (Kruskal-Wallis $H$ test) on the retrieval data revealed that the performance of the three age groups significantly differed ($H = 19.89$, $df = 2$, $p < .001$). Post hoc analysis (Mann-Whitney $U$ test) confirmed the differences between the 3;0- and 3;6-year-old children ($U = 12$, $p < .001$), between the 3;0- and 3;10-year-olds ($U = 66.5$, $p < .01$), and between the 3;6- and the 3;10-year-old children ($U = 44.50$, $p < .001$).We also examined the pattern of performance of individual children. To meet the criterion of a successful participant, a child had to find the toy on at least four of six trials. The analysis of the individual performance of the fifteen 3;0-year-olds showed that only two of them met the successful criterion. The analysis of the individual performance of the 3;6-year-olds showed that the execution of this group was divided between those children who performed above chance (seven) and those who did not (eight). As far as the 3;10-year-olds, 10 of 15 met the successful criterion. According to Fisher's exact test ($p < .05$), there was a reliable difference in the patterns of performance between the 3;0- and 3;6-year-olds and between the 3;6 and 3;10-year-olds.

These results, compared with prior research that has looked at the spontaneous comprehension of other symbolic objects, suggest that the map we employed was not an easy one. For instance, Peralta and colleagues found that with no instruction at all, 3;0-year-old children successfully used photographs (Salsa & Peralta, 2007) and similar scale models (1:2) (Peralta & Salsa, 2003) as sources of information in search tasks. On the other hand, in studies using scale models which were very different in size from the real space they represented (1:16) children did not achieve a representational insight on their own before 5 years of age (DeLoache et al., 1999). The high level of iconicity of photographs and similar scale models facilitates symbolic comprehension, while the noniconicity of the map we employed made it difficult for children to establish the symbolic connection. The results are in line with the claim that perceptual similarity promotes symbolic comprehension at early ages (DeLoache & Sharon, 2005; Peralta & Salsa, 2003).

In sum, the results show that 3;0-year-old children did not comprehend the map-room connection on their own, while the 3;6-year-olds showed a divided performance (some of them did grasp it and some of them did not). Four months later, at 3;10 years of age, most children spontaneously

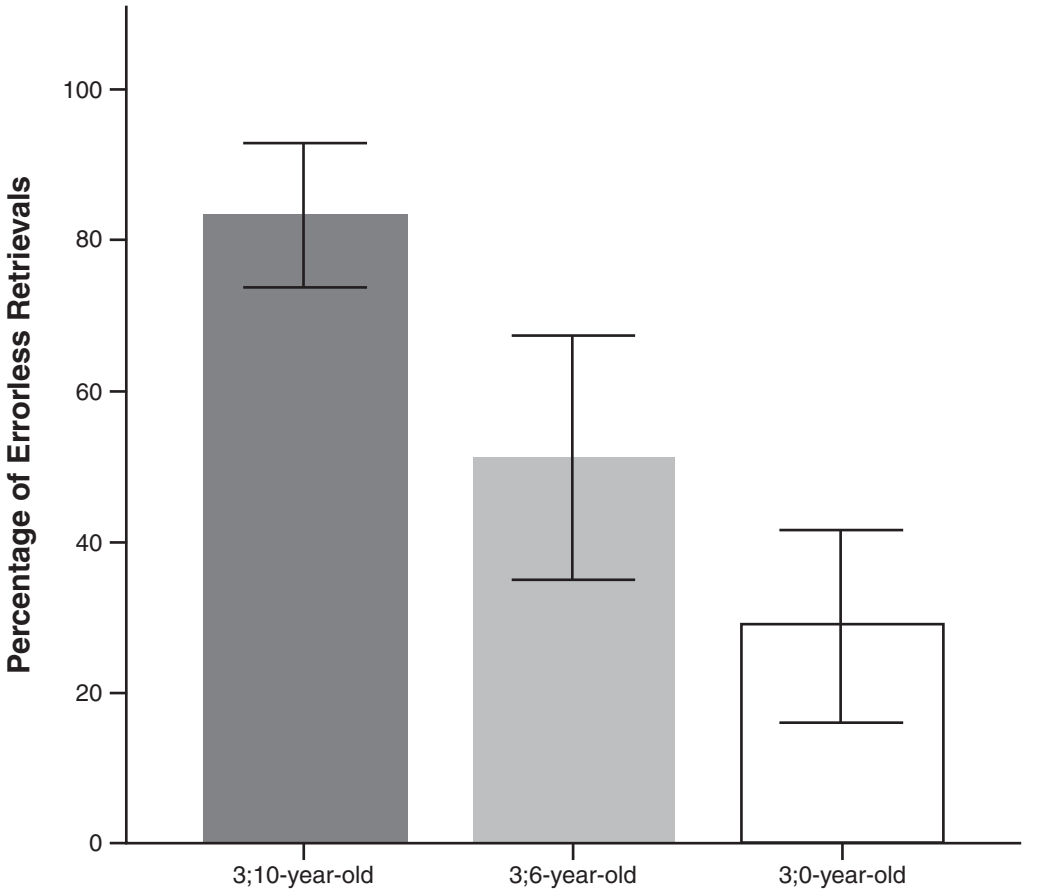


FIGURE 2 Children's percentages of errorless retrievals by age group. No instruction condition.



understood the symbolic function of the map using it to guide their search in the real space. With this baseline, we now turn to our central goal: to study the influence of teaching on the early comprehension of a symbolic object.

## EXPERIMENT 2

The main objective of this experiment was to investigate if 3;0-year-old-children could understand and use a symbolic object as a source of information if explicitly taught. For this purpose, we compared the impact of no instruction, complete instruction, and teaching on children's performance in a map search task.

## METHOD

### Participants

Forty-five 3-year-old children equally divided into three groups participated in this study: no instruction condition (35–37 months old, $M = 36.7$ months, $SD = 0.83$ months), complete instruction condition ($M = 36$ months, $SD = 0.83$ months), and teaching condition ($M = 35.87$ months, $SD = 0.91$ months).

### Materials

Materials were the same as in Experiment 1.

### Procedure

The session lasted approximately 15–20 min. After a brief warm-up, the experimenter presented the toy to be hidden and oriented the child to the room and its furnishing following the same procedures described in Experiment 1.

#### *No instruction condition*

Participants did not receive any information about the symbol–referent correspondence or the intended function of the map. Procedures of this condition were the ones described in Experiment 1.

#### *Complete instruction condition*

Participants received detailed and exhaustive information on symbol–reference correspondences and the intended function of the map in the task, emphasizing the fact that the symbol could help in finding the toy. The specific procedures were as follows. After the introduction of materials using the described in Experiment 1, the experimenter explained to the child that the purpose of the map in the task was to represent the room, "This is the frog's house and this is the picture of the frog's house," while pointing at both. The experimenter also demonstrated the correspondence between the items of furniture in the room and the corresponding objects depicted in the map naming the elements and highlighting the relationship between them, "Look at the picture, this is the frog's bed and this is the bed in the frog's house." Then the experimenter asked the child to establish correspondences, saying, "Can you see the closet in the frog's house? (pointing at it). Show me the closet in the picture of the frog's house." If the child failed, the experimenter pointed at both, the object and its representation on the map, stressing their correspondence. This procedure was carried out three times and, then, the test began. After having hidden the frog, the experimenter highlighted again the purpose of the map in the search: "This

picture of the frog's house will help you find the frog in its house. Look at the picture, the frog is hiding right here (pasting a sticker with a cross on the hidden location). Take the picture and go find her." If the child found the toy, the experimenter said, "Good job!" If the child did not find the toy, the experimenter retrieved it saying, "I guess the frog is over here."

### *Teaching condition (complete instruction plus corrective feedback)*

Although in the teaching condition the introduction of the materials as well as the orientation and the instructions delivered before the task were identical to those of the complete instruction condition, important differences did exist in the execution of the test. In this condition, if the child failed the first search attempt in any of the six trials, or did not search, the experimenter corrected him or her and provided contingent information and a demonstration concerning how to use the map to solve the task. That is, she retrieved the hidden toy and emphasized, again, the map-room correspondence. "The frog was hidden in the same place as I pointed before in the picture but in her house, can you see both? One is the bed in the frog's house and the other is the bed in the picture of the frog's house" (pointing at each). She also highlighted once again the symbolic function the map has in the task, "The frog is hidden in the same place I put a cross in the picture, but in her house. Look! The picture will help you find the frog" (showing the map to the child). If the child found the frog, the experimenter said, "Good job. The frog was hidden right where I showed you in the picture of her house, both places look alike, one is the real one and the other is its picture." If the child did not find the frog, the experimenter took it out from the hiding location explaining and demonstrating again the correspondences and the function of the map in the task.

In sum, the differences between complete instruction and teaching conditions were (a) in the instruction condition, the informational support was provided only before the test, whereas in the teaching condition it was provided before and during the test; and (b) in the teaching condition, the informational support implied not only giving complete instruction, and it also involved corrective feedback, that is, contingent information and demonstrations when the child failed the first search.



## RESULTS AND DISCUSSION

Results showed that the no instruction group found the toy in the first search attempt on 27% of the six trials ($M = 1.73$, $SD = 1.48$) and the complete instruction group on 28% ($M = 1.6$, $SD = 1.35$) of the trials, whereas the teaching group achieved 60% errorless retrievals ($M = 3.6$, $SD = 1.63$). Binomial test indicated that only the teaching group performed reliably well above chance ($p = .001$; Figure 3).

A one-way Kruskal-Wallis analysis of variance on the retrieval data revealed that the performance of the three groups significantly differed ($H = 11.29$, $p < .05$). Post hoc analysis showed differences between the teaching (60% correct) and no instruction groups (27% correct; $U = 46$, $p < .001$), and between the teaching and the complete instruction groups (28% correct; $U = 46$, $p < .001$); but, surprisingly, no significant statistical difference was detected between the complete and the no instruction groups ($U = 33$, $p = .87$).

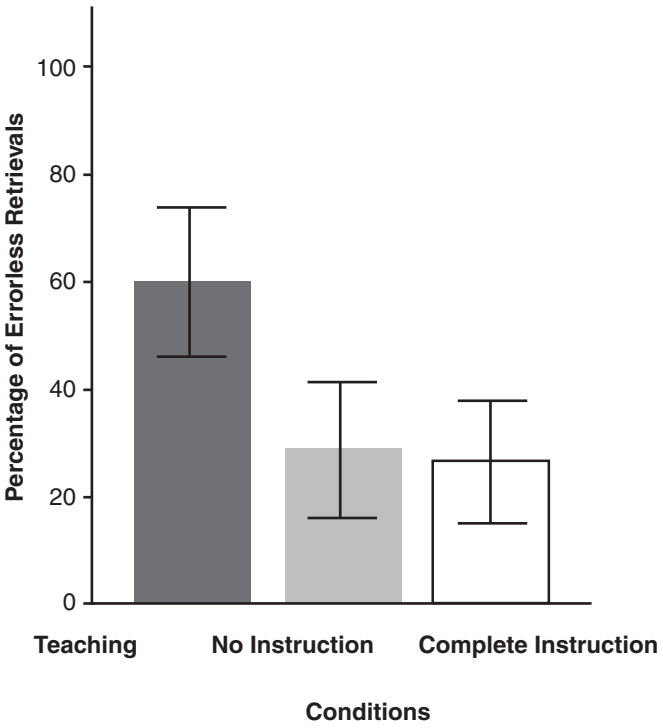


FIGURE 3 Three-year-old children's percentages of errorless retrievals by condition.



The analysis of the individual performance of the teaching group indicated that of the 15 children who participated in this group, 10 met the successful criterion (they performed correctly in at least four of six trials). However, in the complete and no instruction groups only one and two children respectively met the criterion. According to Fisher's exact test ($p < .001$), there was a reliable difference between the patterns of performance of the teaching group and the complete and no instruction groups.

It is worth noting that most children in all three conditions failed the first trial, but only the performance of the ones of the teaching condition dramatically improved from the first (13% of errorless retrievals) to the second trial (60%). The McNemar test indicated that this change was significant ($p = .039$). They also continued improving, reaching an 83% of correct retrievals on the sixth trial (McNemar, $p = .01$). The poor execution of these children in the first trial shows that, regardless of the exhaustive orientation and complete instruction received before the task started, they did not recognize the map-room connection. However, once they failed and the experimenter contingently explained and demonstrated how to use the map, their performance significantly improved.

The no instruction group achieved 13% correct retrievals in the first search and maintained the same percentage in the second search. The complete instruction group started with 33% correct retrievals in the first search and dropped to 20% in the second search. McNemar tests indicated

that neither the complete nor the no instruction groups significantly changed between the first and the second trials ($ps = 1$ and 5, respectively). These two groups showed a modest nonsignificant improvement in the rest of the task, probably due to familiarization, reaching both around 49% correct retrievals in the last trial performed.

The results of this experiment show that at certain points in development, complete information about a symbol–reference relationship is not enough for symbolic insight. However, when corrective feedback is provided, children's representational understanding is highly facilitated.

In summary, the results indicate that 3-year-old children did benefit from adult teaching and gained a symbolic understanding of the map, comprehending and using it as a source of information to find the toy in the real space. Given these results, we wondered if it was possible to teach even younger children the representational function of the map; Experiment 3 addressed this question.



## EXPERIMENT 3

The aim of Experiment 3 was to investigate if adult teaching would promote the symbolic comprehension of the map in 2-and-a-half-year-old children. We compared the performance of 3;0- and 2;6-year-old children in the teaching task.

### METHOD

Fifteen 2;6-year-old-children (29–31 months old, $M = 30.20$ months, $SD = 0.94$ months) participated in this study. Their performance was compared to the 3;0-year-olds of Experiment 2.

We used the materials as in the previous experiments. The procedures were identical to those of the teaching condition of Experiment 2.

### RESULTS AND DISCUSSION

In spite of the teaching provided, 2;6-year-old children did not recognize the map as a source of knowledge to guide action (12% correct retrievals; $M = 0.87$, $SD = 1.12$). The poor performance of this group was also evident in the analysis of the individual performance; of the 15 children who participated in this group, only one achieved the successful criterion performing correctly in at least four of six trials.

The comparison of the performance between the 3;0-and 2;6-year-olds indicated that the oldest group performed significantly better ($U = 24$, $p < .001$). These results revealed that the 2;6-year-old-children, even after being explicitly taught, did not see the symbolic connection between the map and what it represented. Six months later, however, children profited from adult's teaching.

The difference detected in the performance of the two age groups could be attributed in part to a lack of cognitive flexibility of the younger children. Cognitive flexibility allows taking advantage of adult teaching and becoming aware that the map is both an object in its own right and a source of information concerning the location of the toy. The difference may be also attributed to the

younger children's limitations in information processing and language skills. These results show that the facilitating effect of social cues and feedback is probably dependent on both, the child's cognitive maturity and the relative difficulty in comprehending a particular symbol.

## GENERAL DISCUSSION

Understanding that symbolic artifacts have a representational function is a major developmental accomplishment. This understanding is rooted in several factors: some of these, like perceptual, cognitive and action mechanisms, are brought by the child; while others, like experience with symbolic objects and contextual informational support, are provided by the social context. In this sense, it has been proposed that symbolic understanding is founded in perceptual differentiation, perceptual categorization, imitation, analogical reasoning and social learning (Callaghan, 2005; Callaghan, Rochat, MacGuillivray, & MacLellan, 2004).

One source of learning is observation and another is direct intentional teaching. Adults typically instruct children how to engage in particular behaviors in communicative and referential interactional contexts. Csibra and Gergely (2009, 2011) called natural pedagogy to this special and uniquely human kind of social learning that allows the acquisition of shared and knowledge without the extended acquisition process that statistical observation and trial and error learning require.

In the present research, we examined the role of direct intentional teaching in early understanding of a symbolic object, a map. We started by observing the age at which children comprehended the representational function of the map on their own (Experiment 1). Results indicated that most 3;10-year-olds spontaneously understood that the map represented the room while 3;6-year-olds showed a divided performance, some of them did and some of them did not understand the map's function. On the other hand, most 3;0-year-old children did not realize that the map represented the room at all. Given these results, we wondered if it was possible to teach the symbolic function of the map to children this age.

As has been demonstrated, the amount of instruction as well as the kind of instruction provided impact on young children's symbolic comprehension (e.g., DeLoache, 1989; DeLoache et al., 1999; Peralta & Salsa, 2003; Salsa & Peralta, 2007). In the research we present here, we went a step further by showing that it is possible to teach very young children the symbolic function of an object, at least at particular points in development. The success 3;0-year-old children had in the task depended on receiving corrective feedback in response to their performance. Children's execution significantly improved once they failed the first search and received corrective feedback, contingent information and action demonstration.

How did this teaching work? Why children who were corrected gained a representational insight while those who received complete instruction at the beginning of the task did not? One possibility is that by providing corrective feedback the adult conveyed her communicative intent, encouraging the child to see through the symbol to its referent. According to Leekam et al. (2010), these social cues mediate children's understanding of the symbolic function of an object helping them to take a dual stance to it—to see it both as an object and as a representation of something else.

We consider that the feedback in response to the children's first failed search was the key factor that allowed them to infer the teaching intention of the experimenter. The feedback provided invited children to read the scenario as a pedagogical situation (Csibra & Gergely, 2011; O'Doherty

et al., 2011) and help them benefit from the corrections and demonstrations received. We determined that one source of error in this type of tasks consisted of not detecting symbol–object correspondences and the intended function of the map in the task, when the child failed we highlighted and demonstrated both again. This seemed to be an effective instructional move as children benefited from it.

Our results are in line with studies on word learning that have demonstrated that contingent interaction is the heart of social learning communicative processes (DeLoache et al., 2010; O'Doherty et al., 2011; Roseberry, Hirsh-Pasek, & Golinkoff, 2013). The results also agree with studies that illustrated the facilitative effects of parental guidance on the comprehension of the representational status of graphs (Gauvain, De la Ossa, & Hurtado-Ortiz, 2001; Szechter & Liben, 2004) and videos (Troseth, 2003).

By 3 years of age, toddlers may have already established scripts for the ways adults typically interact and teach them new information. Therefore, children may have expectations of how learning situations are like and are likely to learn in contexts that match these expectations (Leekam et al., 2010; O'Doherty et al., 2011). The 3-year-old children who participated in our study were probably used to teaching contexts in which they were instructed about actions and conventions receiving feedback after their actions.

In this line, in a very common social interaction such as picturebook reading, it has been observed that when very young children labeled the pictures incorrectly either spontaneously or in response to maternal requests, mothers always corrected them and no errors passed without being noticed. On the other hand, when children labeled the pictures correctly, they received positive feedback only sometimes. No feedback meant acknowledging children's behavior (DeLoache & Peralta, 1987; Peralta, 1995).

In the present research, the absence of corrective feedback to the children's failed searches in the complete instruction condition may have contributed to their low level of success, as illustrated by the lack of differences between the no instruction and the complete instruction groups. Despite the orientation and exhaustive instructions received, including naming the objects in the room and in the map in both instances of the procedure, children did not capture the symbolic function of the object or realize that their performance was incorrect. In this point it is worth noting that the 3-year-olds of our study performed even poorly with complete instructions than this same age children did in related research (Dalke, 1998; DeLoache & Marzolf, 1994). This difference is due to the low level of iconicity of our map compared to the ones used in those studies.

A limitation of Experiment 2 was that it left open the possibility that corrective feedback alone may be enough. In future studies it would be of interest to examine whether the improvement observed in the teaching condition stems from the combination of instruction plus feedback or whether feedback alone is sufficient. It would also be important to carry out transfer studies in order to further evaluate the learning effect of the intentional teaching provided.

In sum, in the present research we show that at some point in development it is possible to teach very young children the symbolic function of an object. Contextual support in the form of corrective feedback appears to be a powerful mechanism that allows the child to read the situation as a teaching scenario and learn from it. In the absence of such support, the impact of instruction on young children's symbolic comprehension may be hindered. Communicative interaction with supportive adults appears to be a powerful mechanism that drives symbolic understanding during

early childhood. Early comprehension and use of symbolic objects, not only restricted to the particular map used here, is deeply rooted in developmental and contextual factors.

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