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## THE MICROGENESIS OF GRAPHIC REPRESENTATION IN CHILDREN

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The task of picture drawing was analysed in terms of the nature of children's perception and their understanding of the instruction. It is suggested that the drawing task should be understood as a problem-solving task, and that a picture thus drawn is the result of a series of problem solvings, each of which is exercised within a diminishing possibility resulted from the accumulation of previous steps. Children's drawings contain unintended result of problem-solvings. Observations of children refusing to draw under some conditions, and of the perceptual conflict during a drawing task of an 8 year old boy were reported. Analysis of these observations showed microgenetic process of perceptual conflict and emergence of new skills in graphic representation.

Key words: action, children's drawing, microgenesis, perceptual conflict, problem-solving,

### I. INTRODUCTION

Children's picture drawing can be approached from various angles. In connection with the motor skills necessary in drawing, the related issues of the development of prehension or grasping has been the focus of interest for developmental researchers since the early period (e. g., Halverson, 1931 ; Ames, 1948). However, modern research on children's drawings seems to focus mainly on the cognitive-perceptual aspect. This includes the constructional (or process) aspect of picture drawing (Thomas and Silk, 1990). There is relatively little research on the motor skills of children's picture drawing.

One motive underlying the attention on the topic of children's drawings is in their relevance to the understanding of the process of cognitive and representational development. Another concern of the researchers is the expectation that investigation on this subject may produce practical advice for art education of young pupils, normal or otherwise. Furthermore, children's drawings have also been studied from what has been termed the "clinical-projective" approach. While these considerations and viewpoints can be identified in the not very long history of the subject (see Freeman and Cox, 1985, Harris, 1963, and Thomas and Silk, 1990, for more comprehensive reviews), and therefore, representing more successful and fruitful aspects of the subject, not much attention has been focused on what I would call the phenomenology of drawing as

problem-solving and of the interpretation of drawing.

In this paper, I am going to discuss the issue of children's perception of the drawing task. That there is something peculiar to the perception of this task by children around the ages of 5 and 6 can be shown by the observation that under some conditions children sometimes fail to draw completely; the task being rejected as impossible. In such a situation, while it seems natural for the researcher to modify his/her task so that at least the child can be persuaded to draw, the very act of modifying the task has the effect of abolishing the opportunity for allowing the problem in question to appear! In this paper, I suggest that the children's inability to draw under such a situation implies something special about the children's perception and interpretation of the drawing task, the understanding of which would shed light on our understanding of children's drawings. I propose to address to the issue by making an exploratory analysis of the structure of the drawing task. Furthermore, although the significance of this issue (or further understanding of it) is yet to be explored, it is my belief that it would add something to, not only our understanding of children's drawings, but also to our understanding of the development of children's perception of events.

## II. PICTURE DRAWING TASK AS COMPLEX ACTION AND PROBLEM-SOLVING

Barrett, Beaumont and Jennett gave a descriptive example of what happened during the picture drawing task for children to show how the process of picture drawing was not a simple affair (1985, p.176). Indeed, there are a large number of decision-makings to be made in accomplishing the task. In this paper, the drawing task is to be considered as a problem-solving process, and the behaviour of the children in producing the picture is to be analysed as a series of goal-oriented action.

So long as the meaning of the term "action" can be agreed upon as having the invariant characteristics of "goal-directedness" and "conscious planning" (Valsiner, 1987, p.145), the process of producing a picture can be viewed as action. In what follows the picture drawing task will be analysed and illustrated from this point of view. In addition to these intra-personal aspects, the importance of an inter-personal aspect, the process of negotiation between the subject and the experimenter who is present, will be emphasized.

### A. Goal-directedness

Whether the child is producing a picture out of his/her own will, or is being asked by a researcher to do so, the child can be said to have a goal. In the former, a child has his/her own idea of what to achieve, although he/she might have obtained the idea by observing other children, or simply by remembering one such incident. In terms of the actual execution, he/she might have to organize the environment so that the necessary materials are available for use, instead of having them prepared, or even specified, by other people. In contrast, in the case when the child is asked to draw a picture, a goal is being introduced from outside the child. The understanding of the researcher's words or instruction constitutes a necessary step in having the goal. Needless to say, the specific form of the goal thus obtained depends on how the instruction is being interpreted. The goal can be self-produced; it can be adopted from outside, such as being "forced" by the experimenter. Once adopted, the goal has to be

monitored and compared with current state so that behaviors can be organized toward its realization. In other words, during the execution, subgoals or sub-steps have to be planned and carried out, the resulted performance be compared with the set goals. In case of mismatch between set goals and current state, correction or adjustment has to be implemented.

#### **B. Planning**

The task of picture drawing usually takes place in limited time and space. In terms of time given, the task usually has to be carried out within a certain limit of time during which several "parts" have to be executed in sequence. Human figure drawing, for example, consists of drawing different parts of the body which has to be done one by one within the time given for the task. In terms of space, the different parts of the human figure have to be represented and arranged within the limit of a paper of a definite size either given by the researcher or chosen by the drawers among available ones.

#### **C. Negotiation between the subject and the experimenter**

The picture drawing task usually takes place in a social situation, with the experimenter giving instruction and the subject trying to meet what he/she is supposed to perform. As the details of how a session is conducted and how the task is to be carried out are either not the main interest of the researcher, or are specified or "controlled", they do not appear to be problematic in research conducted in the empiric-positivistic tradition. However, as will be illustrated in the later part of this paper, the task situation includes occasions where the subject's negotiations with the experimenter occur. What is called negotiation here includes occasions such as when the subject alters the direction of the paper from what was first given, or when the subject asks questions concerning details not anticipated by the experimenter. The subject might even make unfavorable judgement on his/her performance which results in the subject's rejection of some or all parts of the picture produced. How these details are negotiated depend not only on the personal factors which are not apparent, but also on the nature of the control the researcher has designed for the study.

#### **D. Unintended by-products**

As it is unusual to think of children's picture drawing from an analytical point of view, it is perhaps not obvious to an ordinary observer that the drawing task involves at least the following steps: (1) producing some kind of image(s) as an answer to and as a result of interpreting the task instruction, (2) planning what (kind of line, of shape) and where (within the paper) to execute on the paper, and (3) arranging these steps in sequence. However, while planning seems necessary and inevitable, once non-optimal planning is implemented, there is no absolute criterion or constraint to prevent the child from continuing. The result may be a "strange" or "childish" picture, but in the child's mind, there is no absolute standard by contrasting with which the child is arrested from executing whatever he/her has in mind. In other words, children have a very great tolerance for many varieties of drawings; they are

not critical of their own solutions. As a result, children's drawings contain not only the first solution to whatever is perceived and interpreted as the primary problem in the drawing task, but also the subsequent solutions to other problems which are engendered, or modified, by the first solution. The first solution often creates unintended by-products which constraint subsequent solutions.

### III. PERCEPTUAL CONFLICT DURING DRAWING TASK: A CASE STUDY

Among children of the ages of 5 and 6, the task of drawing three-dimensional object is sometimes rejected as being impossible. This has been observed when the object presented was relatively large, for example, a box about 25 cubic cm. Children refuse to draw the object for reason such as "It is too big", or "The paper is too small" (when the size of the paper provided was  $16 \times 30$  cm, or larger). (Note). Another observation to be mentioned is the tendency of younger children in producing a picture of colour patches, presumably corresponding to the shapes and colors of the various faces of the object.

These events tend to be overlooked or treated as "incorrect" response of the children that is unexplainable, and usually categorized as one of the primitive classes. However, these events and an additional observation made about the conflict shown by a normal 8 year old second grader (to be described below) give the impression that children bring with them something additional to the task of drawing object that they have direct experience of handling. And it is this additional something that causes problem in carrying out the drawing task.

#### A. The task

The task given to the 8 year old boy was to draw, "as seen", three objects separately; a cylinder (diameter=5 cm, h=6 cm), a cone (diameter=6 cm, h=10 cm), and a tetragonal pyramid (5×5 square cm, h=9.6 cm). All the faces of the objects were in different colors. The object was placed to his left, about 90 cm away from him, and about 45 degrees below his eyes (Figure 1). He was given 4 sheets of paper ( $21 \times 29.6$  cm). The whole process was video-recorded and the following descriptions and analyses are based on this record.

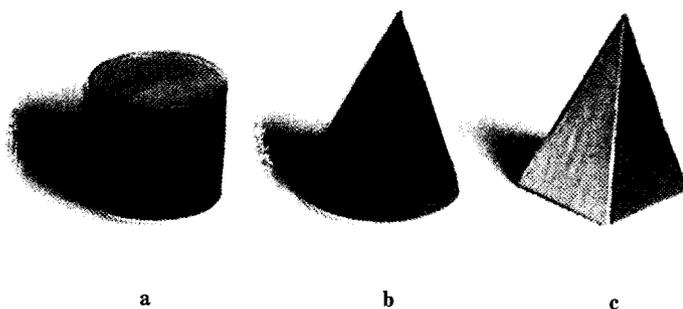


FIG. 1 The three objects used in the task

*B. The performance*

He first drew an oblong square with the top line slightly curved, then using a pen of different colour to attempt an oval on the top (Figure 2, a). The oval was not yet finished when he announced that it was a "failure". He was urged by the experimenter to try another one. Using the same pen, he then started from the oval outline. As he finished it, he hesitated for a long time before he changed pen to draw the rest. While he was hesitating, he made several feint strokes in the air above the oval outline he had drawn, as if to try out the shape and position of these lines. He then drew an oblong square with the top line slightly curved, a shape almost identical with what he drew in the first attempt (Figure 2, b). He again announced that it was "wrong". In his third attempt, he started with the oval shape on the top, then one perpendicular line each from both ends of the oval shape, and finally connecting the bottom ends of the two perpendicular lines. Here, instead of a right angle, he very carefully curved the joining part, while he muttered to himself "Yes. Yes. Here. It should be like this" (Figure 2, c). He pushed the paper toward the experimenter and said "Done!"

When shown the second object (Figure 1, b), he managed to draw the object with the bottom line slightly curved up (Figure 2, d). However, the third object, a pyramid (Figure 1, c) again caused hesitation. Announcing it wrong, he gave up the

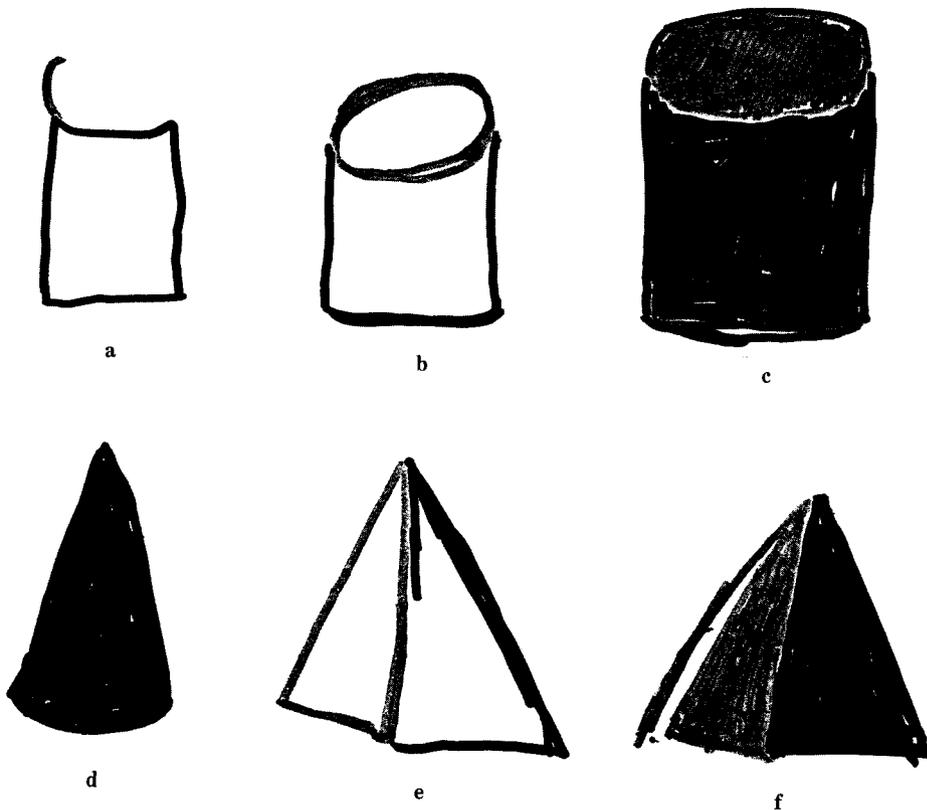


FIG. 2 Six drawings by an 8 year old boy

half drawn shape and turned the paper over (for there was no more paper under the one he was drawing), and drew two triangles, side by side (Figure 2, e). Not satisfied with this ("the line is too straight"), he attempted it again in the space left, only to find himself repeated what he just drew; two triangles side by side next to each other, with almost horizontal bottom lines (Figure 2, f). He was obviously very puzzled by, and dissatisfied with his last performance, for he kept commenting on what he thought was "the mistakes". He said, in a low voice, half addressing the experimenter, half to himself, that he wanted to put crosses on "those wrong lines". After denouncing his first attempt at drawing the pyramid, he turned the paper and found no more left, saying "No more". With no more paper left, and without being further encouraged by the experimenter to continue, he seemed to have sensed that he had to end the session. He gave up making further attempt to draw, and pushed the drawing toward the experimenter, without saying "Done!" He did not attempt to negotiate further, partly because the events and experience had so accumulated that, as a second grader, he felt it not proper to be too insistant.

### *C. Interpretation*

Now, a comparison of the three drawings of the cylinder shows that the only difference is in the joining parts. It seems to be the case that after two trials, he eventually found an agreeable solution to the conflict between his perception of the object and his skills in representing. In other words, it was as if he could not persuade himself, before the third attempt, that the bottom part of the cylinder could be drawn similar to the curve line on the top as he had done. What is interesting is that when drawing the top part of the cylinder, he was able to use an oval shape or a curve line to represent what he saw, he did not succeed in representing the bottom part of the object; he drew a straight line to connect the two perpendicular lines to form a square bottom. This suggests that the child's "failure" might have other reasons than simple inability in using curve line for representing the top or the bottom parts of a cylinder. The answer to the puzzle lies in the nature of the conflict that seemed to bother the child during the drawing task.

### *D. The nature of the conflict*

The observation described above was a part of a larger research project on the development of motor skills in drawing. The experiment was so designed that after the production task (i. e., children drawing the objects presented), a recognition task was also administered, to clarify the production vs. recognition issue. It was in the child's verbal response during the recognition task that a clue to the nature of the conflict was to be found. In the recognition task for the cylinder shaped object, he was presented with a set of 6 pictures which the experimenter had prepared (Figure 3). He had no difficulty in choosing the "correct" one (Figure 3, f) as representing what he saw. However, when asked to compare it with the first and the second drawings he did (and had subsequently denounced as "wrong"), he commented that the difference was in the straight line in his own drawings and the curve line in the "correct" picture he had chosen. When asked which better depicted the object "as seen", he answered

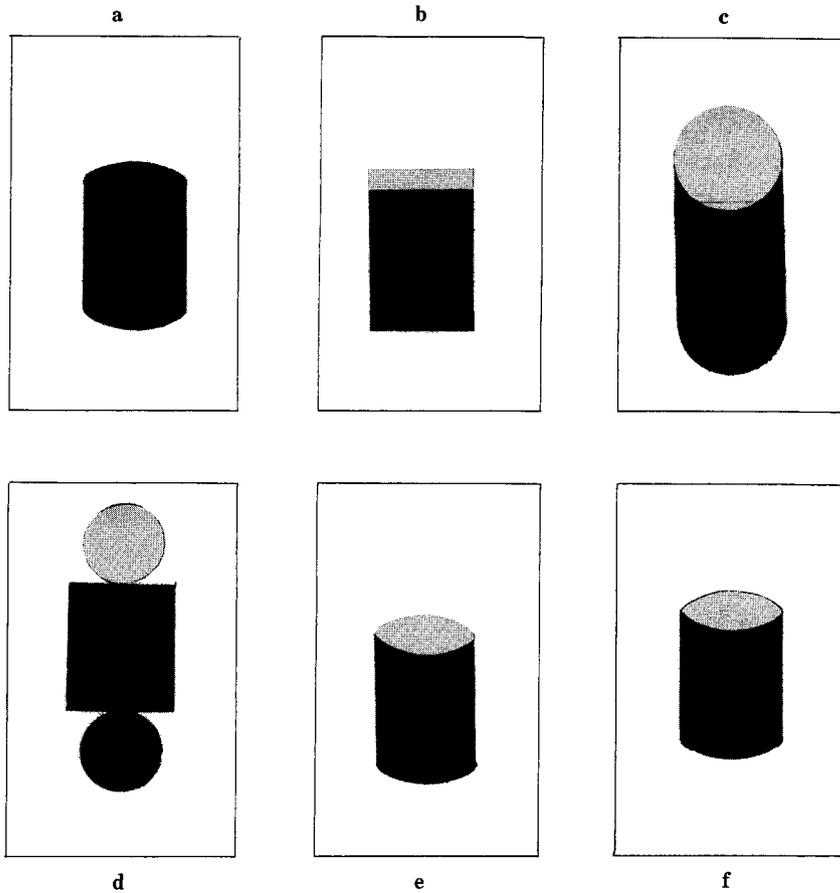


FIG. 3 The six cards used in recognition task for cylinder

“Mine is better, because yours looks unstable”. He was referring to the curved bottom line in the picture. It is perhaps difficult for ordinary adult people to see the point in his comment, for we have learned the conventional graphic representation for round or cylinder shape of object (i. e., by way of curve line), and we have been “persuaded”, through our experience, to perceive the curve line at the bottom as also conveying the sense of stability of the object. To the adult people, the curve line at the bottom of the picture of a cone or cylinder no more suggests the possibility of movement (i. e., instability) of the object. It is this kind of conflict that puzzled our subject during the task. Recall the observation mentioned earlier concerning the inability to draw owing to the size of the object. That phenomenon does not seem to be unrelated to what has just been discussed. To both observations suggest the possibility that children bring with them something additional in their perception of the object and of the drawing task.

If it is permissible to describe the picture drawing task as requiring the drawer to select a part of their experience with the target object and to represent (transform) it, while inhibiting other part, the phenomena described above can be considered as

suggesting the possibility that some children, under some conditions, fail to inhibit, or at least, find it difficult to do so. When the children refused to draw and gave size (either of the object to be drawn or of the paper) as the reason, the conflict seems to lie in the fact that somehow the children felt imperative to represent all the experience they had obtained from handling and seeing the object, including the tactile and visual experience of the size. They failed to draw because they did not (or could not) transform and inhibit the part of their experience which, when translated into actual execution, created the size problem.

This seems also to be the case with the 8 year old boy, for the straight lines he drew to represent the bottom of the cylinder and the pyramid were supposed to represent what he felt as a sense of stability of the objects on the flat table surface. In other words, the child's problem was caused by a conflict between representing what he felt as a sense of stability of the objects, and the perception of the curve line (which to him suggested more about the possibility of movement (i. e., instability) than the roundness of the objects). It is also interesting to note that he vacillated from a "successful" drawing of the cone, after two "failures" and one successful attempt in drawing the cylinder, to three consecutive "failures" for the pyramid. And again, during the recognition task, he first chose the "correct" one prepared by the experimenter, but when asked which better depicted what he saw, he opted for his own solution which he once denounced as incorrect. The vacillation suggests perceptual conflict and the instability of the understanding he was beginning to grasp.

#### IV. CONCLUDING REMARKS

Although there are several aspects of the events I described and interpreted above which need further confirmation, the phenomena are not uncommon. However, because when one is confronted with them, one of the common responses of the researcher is to modify the task or to replace the subject, these problems do not seem to have attracted enough attention so far. Furthermore, there are several problems which can be asked about these phenomena that can hardly be answered now. For example, Why these problems do not seem to occur in younger children? What is or are the individual factors which are responsible for these phenomena to appear? Indeed, how can one better account for these phenomena? The following are my speculations.

The experimenter's instruction (i. e., "Draw a picture of an object".) is a message whose meaning has to be interpreted and grasped in terms of actual behaviour of the subject. There is nothing in the words (e. g., to draw, to represent, etc.) that can guide the receiver of the message as to how actual action should be taken. In contrast with drawing "out of one's head" ("free drawing"), to draw an object involves quite different operations, some of which are not necessarily self-evident to younger children. Some operations or steps are so private that experience is necessary before correct judgement can be made that will lead to what eventually constitutes proper, or acceptable, understanding of the message. Indeed, even "free drawing" is not so easy. There are so many other similar things in life that need to be learned like this.

In the drawing task situation, a lot of things are assumed by both the researcher

and the subject. The verb “to draw” (i. e., when applied to drawing an object), does not specify the details in the manner of representation, nor does it stipulate the manner of treatment of the relationship between the drawer and the object (or whatever sensory experience derived). The drawer is free, so to speak, in deciding how the phenomenon is to be segmented and what to do with the result of one’s segmentation. When a young child, or indeed anybody who first learns to draw, he/she learns a lot of tacit things, such as what can be effected, what has to be carried out in order to obtain such and such effect, which aspect(s) of one’s experience can be treated in so and so manner, etc. It is only by a slow process that one learns what is more or less expected, after discarding and adding many, on the way.

It seems that our subject in the above case was accidentally “caught” doing the critical learning. In theory, the conflict he showed is not peculiar to him, it could (or should) occur in anyone in the process of learning how to draw an object. One could have crossed the line without knowing it.

#### Note

Another recent observation was related to the author by one of his colleagues, Miss Yukari Shirovani. According to her, the size of objects used in the task had to be reduced, as a result, in order to ascertain more positive response from the subjects. In this case, 6 out of the 10 children between 5 and 6 years of age recruited for the pilot study were said to have refused the task for the same reason.

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