

CHILDREN'S DRAWINGS OF NATURAL PHENOMENA

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INTRODUCTION

Modern science programmes for primary schools stress the importance of communication. For example, Science 5/13 (1973) has communication as one of its broad aims,, covering objectives such as Ability to record impressions by making models, painting or drawing.

Although development in the use of these non-verbal means of communicating observations (painting, drawing etc.) has been accepted as an objective, there has been little effort, to our knowledge, to establish criteria by which teachers can note development in this area. Similarly, there has been scant attention paid to providing guidance to teachers as to how to help pupils improve their ability to communicate observations using these non-verbal means.

In one of the few science education texts to deal with the topic (Bird and Diamond, 1975) the authors base their treatment on a 'stages of development model.' These authors quote Kay Melzi as proposing three stages in the development of children's ability to make pictures.

Scribbling. This is more an exercise for the child to gain facility with the pencil or brush. Very little resemblance is discernible between the object and the picture.

Symbolism. The picture is used more as a symbol of the child's idea of the object than to show what it is really like.

Visual realism. There is now a closer and more detailed resemblance between the object and the picture of it.

(Bird and Diamond, 1975, p. 10)

Many authors writing about children's drawing (see, Eisner, 1972) develop concepts to describe the products of children, and, as Melzi has done, from these concepts argue a series of developmental stages. A set of such concepts recently defined by Barrett and Light (1976) seemed appropriate for use in the present study which deals with children from the preparatory grade and grades 1, 2 and 3. These are the concepts of symbolism, intellectual realism and visual realism. Their use, however, does not indicate acceptance of the notion that they represent stages through which a child passes.

Symbolism and Realism

The concepts of symbolism and intellectual realism have a long history but a definitive experiment by Barrett and Light (1976) established three separate categories for discussing the drawings produced by children.

Luquet (1913, 1927) introduced the phrase 'intellectual realism' and this has since been integrated into Piagetian terminology (e.g. Piaget and Inhelder, 1969). Intellectual realism precedes visual realism and is characterised by the child drawing 'what he knows and not what he sees.' There is an ambiguity, however, in the notion of intellectual realism. Is the child drawing what he 'knows' about the individual object, or about its generic type? It seems clear from Burt's work and from more recent studies (e.g. Freeman, 1972) that early representation is stereotypic in character, and equally clear that visual realism requires attention to the individual object. Hence, we should expect two distinct developmental adjustments. Firstly, the child has to move from depicting what he knows of the present individual object. Secondly, he has to move from representing this knowledge of the individual object to representing his visual perspective upon it. There seems no reason to suppose that these two steps should be developmentally synchronous. Consequently, we should expect to find three distinct stages, for which we shall use the terms symbolism (S) in which the child draws what he knows about the genus, intellectual realism (IR) in which he draws what he knows about the individual, and visual realism (VR) in which he draws the individual object as he sees it.

(Barrett and Light, 1976, p. 198)

Children were, as part of the present study, asked to draw two leaves which were put in front of them. Figure 1a shows the way the leaves were presented to the children and Figures 1b, 1c, and 1d show the drawings produced by three of the children. The drawings in Figure 1b exemplify visual realism. The child has represented as best he can what he could see - an oak leaf on the left and, on the right, an elm oriented in the opposite direction. By contrast, the drawings produced by a boy in the preparatory grade (Figure 1c) show symbolism. The drawings of the two leaves are almost identical e.g. Both have a visible stem and an identical shape.

Intellectual realism is shown by the drawings in Figure 1d. Here the pupil drew the elm leaf in the same orientation as the oak. She explained that the elm leaf was attached to the sheet 'upside down'.

These three concepts have obtained a significant place in the thinking of art educators and developmental psychologists and so have been utilised when analysing the data obtained in this study.

METHODOLOGY

Stimulating and Gathering Products

This study used two separate data gathering procedures. The first involved seven government primary schools in the eastern suburbs of Melbourne. The schools were not chosen at random, but were ones with which various members of the research team had established a relationship. The schools covered a broad range of socio-economic areas.

The procedure involved whole classes. In each class one of the authors (JW) took a standard lesson based on observation of four leaves and discussion of the observations made. After this discussion the children drew the leaves.

Four hundred and thirty-two pupils (Preparatory grade - 117, Grade 1 - 142, Grade 2 - 79, Grade 3 - 94) produced 4 drawings each. There was no time limit imposed on the recording task.

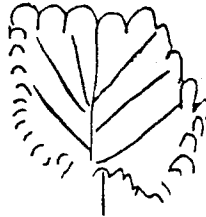
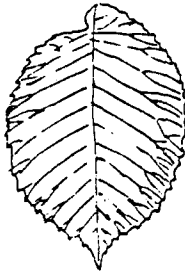
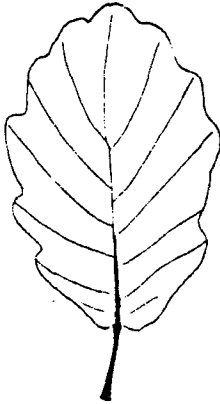


Figure 1a: The oak and elm leaves as mounted on the card and presented to the pupils.

Figure 1b: Drawings of a leaf from an oak and a leaf from an elm which would be categorised as showing visual realism

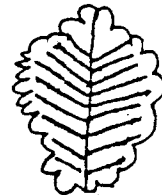
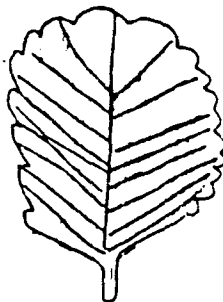
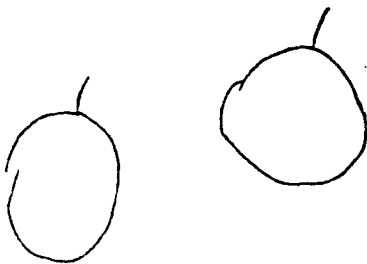


Figure 1c: Drawings of a leaf from an oak and a leaf from an elm which could be categorised as showing symbolism.

Figure 1d: Drawings of a leaf from an oak and a leaf from an elm which would be categorised as showing intellectual realism.

The leaves used for the lesson, and hence the drawing, were an oak, an elm, a prunus and a eucalypt. Each child was given a card to which the set of leaves were attached, the base of the elm being opposite to that of the other three leaves.

Two differences between the leaves are particularly relevant to the data collection and analyses. The first is that the elm leaf does not appear to have a stem whereas the others have an obvious stem. (The stem of the elm is actually behind the blade of the leaf and so is not seen). The second important difference is that, because of the way in which the leaves were attached to the card and the card was presented to the pupils, the lateral veins of the elm leaf appear to run diagonally downward from the mid-vein to the edge whilst the lateral veins of the other leaves appear to run diagonally upward from the mid-vein to the edge.

The data presented in this paper deal with drawings produced by half of the children in each class. The other half of the children were provided with an outline of the leaves and the children were required to complete the drawing. These data are not dealt with here.

Examining the Process

The second procedure was designed to allow the researchers to observe children from the lower primary grades drawing leaves. Two of the authors (*DS* and *KB*) acted as the observers. Ten children were selected at random from each grade level (Preparatory grade to Grade 3) in a government primary school in the eastern suburbs of Melbourne. The children participated in the procedure one at a time.

A card to which two leaves were attached, a set of coloured pencils and a blank sheet of paper (the same size as the card) were given to the pupil and he/she was asked to draw the leaves. The leaves were an oak and an elm. The elm leaf was fixed so that its base was at the opposite end to the base of the oak (see Figure 1a).

The observer kept a record of the order in which the child drew the various parts of the leaves. After the drawings were completed a structured series of questions was asked and the answers recorded.

RESULTS AND DISCUSSION

The set of analyses to be reported in this paper relate to the question: To what extent are the categories of visual realism, intellectual realism and symbolism useful when considering the ability of children in the lower primary grades to communicate their observations of leaves by drawings?

Table 1 presents an analysis of the data gathered by the first procedure. This analysis shows that almost all of the pupils made an attempt to show different edges on the leaves. That is, this evidence suggests that almost all students saw the task as basically one of producing a realistic product.

TABLE 1

Number (percentage) of pupils who drew all four leaves as having the same edge.

Grade level	Number (percentage) of pupils whose drawings of the 4 leaves all had the same edge
Prep.	2 (2%)
1	3 (2%)
2	1 (1%)
3	0 (0%)
Total	6 (1%)

Further support for accepting that the children generally adopted a 'realism' approach to the task comes from the second procedure where a number of children in the Preparatory grade were very reluctant to start drawing the oak leaf. They said that it was too hard because the edge was so 'wobbly'. The few who did produce obviously symbolic drawings (see, for example, that shown in Figure 1c) attacked the task without hesitation and had the task completed, to their satisfaction, within a minute.

However, although this evidence suggests that the task was perceived by almost all students as one requiring realistic representation, the data presented in Table 2 show that a substantial number of pupils drew a stem on the elm leaf although there was none visible, nor known to be there.

TABLE 2

Number (percentage) of pupils who drew a stem on the elm leaf (although no stem was visible).

Grade level	Number (percentage) of pupils who included a stem in the drawing of the elm leaf
Prep.	47 (40%)
1	45 (32%)
2	22 (28%)
3	21 (22%)
Total	135 (31%)

How can this be explained? For at least some pupils the addition of the stem is a conscious decision as is indicated by the following dialogue between the observer and one of the subjects during the procedure.

- O. (Pointing to drawing of elm). You put a stem on it.
 S. Yes.
 O. Why?
 S. It's better with a stem.
 O. Why is it better with a stem?
 S. They can't go on a tree without a stem.

What of others who included a stem in the drawing of the elm? The evidence suggests that, although they approached the task with a view to preparing a realistic drawing, after a time they stopped referring back to the leaf and lapsed into symbolic representation. There are several sources of evidence to support this interpretation.

First there is the subjective evidence gathered by watching the pupils completing the drawing. Although no measures were taken, the observers both noted that after beginning the drawing many of the pupils made no further observations of the leaf. When, on completion of the drawings, the observer pointed out that the drawing of the elm leaf included a stem, although the actual leaf did not have one, many of the pupils looked embarrassed. One pupil giggled nervously and said 'I forgot'.

Further, there is objective data which lends support to the idea that a significant number of students, although beginning with the intention of producing a realistic representation shifted to relying on memory and so their drawings began to represent the child's concept of 'a leaf' rather than a particular leaf. Such data are shown in Table 3.

TABLE 3

Number of pupils who drew the stem on the leaf by one of three methods.

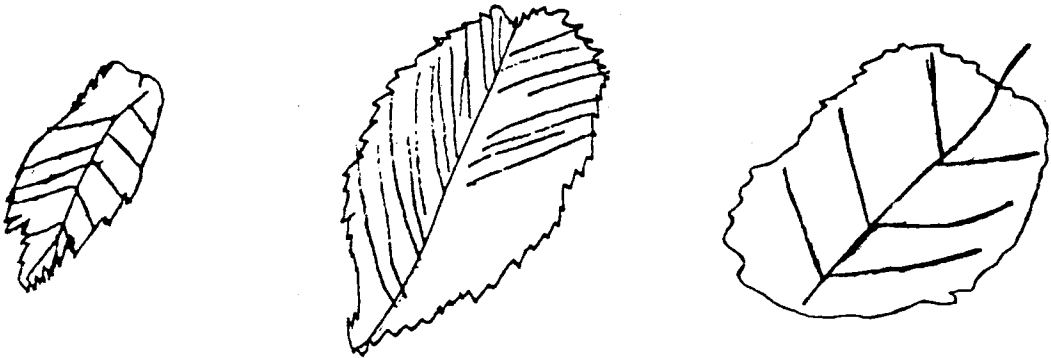
Grade level	Number of pupils who drew the stem by					
	(i) including the stem in the edge		(ii) extending the mid-rib		(iii) adding a separate stem	
	Oak	Elm	Oak	Elm	Oak	Elm
Prep.	0	0	2	0	6	4
1	2	0	2	0	6	2
2	2	0	1	1	7	4
3	2	0	4	0	4	1

Table 3 shows that stems were included in the drawing by one of three methods, viz. including the stem when drawing the edge or outline of the leaf, extending the midrib, and adding on a separate stem. It will be noted that all three methods were used when the pupils drew the oak leaf. However, with one exception, when the stem was added to the elm it was a later addition. These data therefore are believed to support the argument that the stems were added at the stage when the children had shifted from observation to conceptualization.

The questions asked after the drawing showed that at each grade level 8 out of 10 pupils believe that the elm leaf is likely to have a stem when it is attached to the tree. So when the leaf begins to represent conception rather than perception it is likely that stems will be drawn onto the leaf.

Apart from the addition of the stem to the elm leaf there are other analyses of the drawings which add support to this line of argument. These relate to venation. The drawings reproduced in Figure 2 illustrate the issue to be discussed.

Table 4 shows that a substantial number of pupils, although less significant at the grade 3 level, drew the lateral veins (on the drawing of the elm leaf) diagonally upward from the midrib although the elm leaf was placed with the base at the opposite end of the card to the other leaves. In these drawings, therefore, the way these lateral veins were drawn did not show visual realism but indicated either intellectual realism or symbolism.



2(a)

2(b)

2(c)

Figure 2:

Three drawings of the elm leaf. In Figure 2(a) the lateral veins run diagonally downward from the midrib. This represents visual realism. In Figures 2(b) and 2(c) the lateral veins run diagonally upward from the midrib. This does not represent visual realism. It is interesting to note the anomalous placement of venation and stem in Figure 2(c).

Table 4

Of those pupils who drew the venation of the elm leaf in a systematic fashion, the number (percentage) who drew the venation of that leaf

- (i) diagonally upward,
 - (ii) diagonally downward,
- from the midrib.

Grade level	Number (percentage) of pupils who drew the venation			
	(i) diagonally upward		(ii) diagonally downward	
Prep.	32	62%	20	38%
1	62	67%	30	33%
2	31	57%	23	43%
3	25	31%	55	69%

IN CONCLUSION

The interpretation of data presented here leads to the conclusion that the concepts of symbolism, intellectual realism and visual realism have value in that they point to processes which go on when young children are involved in recording observations of natural phenomena. However the interpretation of the data leads to rejection of the notion that these concepts can be used as an indication of stages of development. It can be noted from Tables 1 and 4 that there are fewer students at grade 3 level whose drawings of the elm leaf contain these features which have been argued may indicate symbolism. But, as has been maintained throughout this paper, many of the drawings represent *both* visual realism and symbolism. Some pupils began the drawing by observing the leaf, but as time progressed, ceased to refer back to the leaf and began to include features drawn from the conception of leaves. Accordingly, the idea that the concepts of symbolism, visual and intellectual realism are indicators of a series of developmental stages is rejected.

The paper must close on a cautionary note. As was indicated earlier only one natural phenomenon (leaves) was used in this study. This very limited range of phenomena means that care must be taken in extrapolating the findings to a wider range. We do not yet know the results which would be obtained if phenomena which moved were used, or if the phenomena used were more or less familiar to pupils than leaves, or if the phenomena used were 'more 3-dimensional'. Similarly the data were gathered, in procedure 1, after one particular form of stimulus. Would the result be the same if there were, for example, greater opportunities for the pupils to interact with the phenomena being studied? The need for, and some directions for, future research emerge clearly from this study.

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