

## **SESSION TWO - INTRODUCTION TO 'SORTING'**

### **Preface**

*Clearly there is much scope for clarification and development of the idea of sorting itself.*

*As with matching, visual sorting has been used in these papers as the exemplar, very little attention being given to haptic, acoustic or olfactory sorting.*

*There is also plenty of room for recognising and defining its importance and place in mathematics, language development, etc. and for describing techniques and materials which have already been devised for teaching.*

*For example – what is the relationship between 'sorting' and 'matching' and at what stage of development do they come to be truly differentiated?*

### **Introduction**

The special asocial 'lesson' is a contrived low-handicap situation within which a highly concentrated diet of suitable activities is caused to be exercised in association with suitable materials under optimal conditions.

The intention is to mimic, in the vulnerable child, the normal asocial and semi-social learning or play conditions of young children in sufficient concentration to significantly increase the overall quality and rate of that child's fundamental learning *during the whole of his waking hours.*

The effects of the 'asocial lesson' can and should be enhanced in due course by the deliberate creation of similar but less clear cut sets of conditions at suitable times during the day and, even more importantly, by the teacher's learning to adopt a suitable attitude towards the child so as to encourage his independence and facility in 'working' or playing without social support.

The content of the 'lesson' is also the burden of the child's all-day-long non-social learning so that any discussion of teaching techniques, quite apart from the establishment of a suitable attitude and the maintenance of a proper 'conduct' for the child, apply for all times during the day and can be integrated with semi-social and social activities.

Most of the child's early learning stems from his own movements in creating organised changes in the activity patterns of the sensory receptors and this leads simultaneously to an enlarging understanding of

- (i) his own bodily make up and resources
- (ii) the structure of the space which surrounds him
- (iii) the appearances, characteristics and properties of the objects within that space

- (iv) their orientations, arrangements and movements within that space (i.e. their 'behaviours')

Certain special cases must also be given special consideration when examining fundamental development from the teaching point of view.

- a) the child's operating on his environment through the agency of objects and substances themselves the basis for the use of 'tools'
- b) the child's use of certain of his own behaviours ('expressive' actions) as 'tools' to induce (in due course specific) behaviours in others
- c) the child's labelling elements and concepts in his understanding and the development of intra and interpersonal communication by means of referential symbols/signs

Since all later understanding stems from and consists of variations on prior understanding and since the current state of understanding determines the efficacy of the child's means of increasing this understanding, deliberate educational work/teaching must be directed primarily at underpinning, consolidating and enriching what understanding has already been acquired.

It will be seen that because

- (a) prior experience and understanding make up the substrate as well as the 'tools' for further learning and
- (b) it is the exercise of the activities embodying this experience and understanding, and only this, which can lead to increased novel experience and fundamental understanding,

teaching must consist in encouraging the child to do what he already can do but in greater amounts, greater concentration and under conditions of continual variation in form, materials and situation.

The general trend of development from the earliest hours is of increase in the amount and complexity of the movements of the various parts of the body.

Increasing overlap of the expanding territories of the several movement systems (i.e. arm-hand on each side, head-eyes [ears, and mouth], leg-foot on each side but less important in the average child than other systems), is followed by interaction, a degree of interference and then to 'cooperations' between them.

In this way the movements and of course, from the child's point of view, the associated sensations and perceptions become integrated into a functioning and *learning* whole so that in due course the child can direct, 'concentrate' or 'focus' his interest and attention through any part of the system, the remaining parts supporting, augmenting, complementing or simply refraining from interfering with the protagonists.

Predominantly symmetric bodily activities tend to be succeeded by predominantly complementary actions and by early in the second year a bias toward one side (or 'lateral dominance') diminishes the possibility of lateral competition and consequent confusion. Meanwhile 'continuant' behaviours develop in which imagined (anticipated or possible) perceptions are able to compete with actual or sensuous perceptions for the child's attention.

The reaching of this signal 'stage' in development (usually demonstrable at about fifteen months) allows the child to transfer a number of objects from one place to another successively and so opens up the possibilities as well as laying the foundations for all those activities and actions (perhaps 99.9% of all subsequent major actions) which depend on such a capacity; such as filling a box etc., building with bricks, drawing a picture, threading beads, pairing objects or cards, sorting objects, etc.

As appearances, attributes, properties and component behaviours are sampled and the perceptions stored within the experience, the underlying capacity for associating and linking these develops from the 'continuant' abilities so that in due course situations may be recognised and their natures (i.e. events leading up to their production) interpreted so as to be acted upon by such response pattern types as 'completion', 'continuation' (extrapolation) 'interpolation', 'extrication', 'solution', etc.

### Understanding and 'mental tools'

As previously defined the understanding is the learned mental system which provides the power and direction in the organism's increasing his capacity for learning to learn by the continual sampling of his surroundings. Understanding I envisage as consisting of a system of 'learning-to-learn' tools. There would appear (to me) to be a number of these mental 'tools' through the exercise of which the child's experience is increased and his understanding fashioned. It is the forging and subsequent utilising of these learning (and teaching) 'tools' which seems to me to be the business of the teacher attempting to increase the child's powers for learning to learn.

As an example I have chosen to illustrate this with the learning tools I subsume under the term 'sorting' but before examining sorting specifically let us for a moment look at any deliberately encouraged classroom 'activity'.

### What is our purpose in having the child engage in such an activity?

- |       |   |                                                                                                                                       |
|-------|---|---------------------------------------------------------------------------------------------------------------------------------------|
| Is it | 1 | To provide the child with a skill or trick for amusing others or for inviting praise or approval or promoting acceptability?          |
|       | 2 | To provide him with a skill which he might or will find useful in later life (e.g. with 'sorting', helping to clear up in a factory)? |
|       | 3 | To amuse the child, i.e. keep him busy or occupy his time?                                                                            |

- 4 To increase his capacity for learning and behaving adaptively?

Looked at from 1-4 the earlier suggestions seem to be very unsatisfactory reasons for using an activity, and indeed as *primary* reasons are of themselves insufficient; however looked at in reverse order from 4 – 1, we see that all of these are important and 'good' provided that they *all* apply:

- 4 If suitably employed any and all activities will lead to increased experience and understanding.
- 3 All activities should be enjoyed by the child who should want to engage in them for their own sake.
- 2 Developing abilities for coping adaptively with unexpected situations, and of course, increasing fundamental abilities as a result, provides an excellent, the only true, foundation for being prepared to deal quickly and effectively with the expected.
- 1 A special case of the latter is the child's behaving socially so as to produce an optimal interaction with others within his society and, as necessarily follows from this, cause the least untoward disturbance.

Turning our attention now to our example – 'sorting' – we can apply these criteria:

- 4 'Sorting' then should be taught with the intention of the child's acquiring an effective means of increasing his understanding, i.e. with the intention of encouraging the development and regular use of a necessary learning 'tool'.
- 3 'Sorting' should be enjoyed as a game for its own sake, should be pursuable without the necessary intervention of other people, and be free of anxieties.
- 2 'Sorting' should lead to the accumulation of patterns of experience which allow or foster the efficient and satisfactory handling of fairly frequently occurring situations, i.e. entails the development of 'useful skills'.
- 1 The skill products of 'sorting' activities should aid the child's satisfactory settling into his social environment.

I have suggested that, in developing, the child acquires a number of mental 'tools' by means of which he effectively enlarges his experience and further develops his understanding. Of course each 'tool' has in the first instance to be constructed from earlier experience, particularly from that gained during the physically active handling, deforming and displacing of objects and materials during the early years.

Let me further suggest that one such 'tool' involves a propensity for actively 'associating' ideas and in particular for continually allocating perceptions to

already established (simple or complex) 'classes' or 'sets' according to some perceived property or characteristic felt to be held in common, whilst another 'tool' consists in the recognition or definition of such 'sets' or classes.

It is these two 'tools' – *'allocation of elements to sets'* and *recognition of set definition* or *'classification'* - which for me comprises the composite tool – 'sorting'.

Now it is important to understand that classification by no means requires verbal labelling, in fact it is essential (in my opinion) that the constructions of early classes and their set-definitions should be continually changing, for although more stable classes must evolve (and in due course be labelled), the earlier and the more rigidly this process takes place the less scope there is for originality, creativity or constructive mental shift; in short for flexibility in mental association. Allocation of an element to a set should in fact commonly be capable of changing or 'expanding' the set definition.

In practice I attempt to design each teaching activity so as to embody one or more of the several natural learning tools that I feel I can discern clearly. Hence pre-sorting and sorting activities are designed first to encourage the accumulation of suitable experience, facilitate the forging of a competent and effective tool and thereafter to provide opportunities for the use of the tool including, through other media, its extension, and linking up with other tools.

The next point to get clear is that a child's capacity for discriminating a similarity or difference between elements does not necessarily correlate closely with the child's maturity or competence in his use of the learning tool, and such a discrepancy is particularly likely in vulnerable children. That is to say, a child may be able to select, match (in a matching game) so as to demonstrate his making the discriminations necessary for distinguishing between the model and dissimilar shapes, pattern, etc. without being likely, or indeed able, to perform such an operation in real everyday life which is of course the whole point of the exercise.

Hence our object in such games is to use the child's experience to cause him to learn the tool (in this case the sorting tool) and then to utilise the tool to cause him to increase his experience and further his understanding.

#### 'He first learns to sort, and then he sorts to learn'

We must now recognise that some of the practices often referred to as sorting are something very different from what I am discussing here. For example a teacher's telling a child to put all the buttons together or all the bottle tops into the red dish, marbles into the green one, etc., immediately invalidates the process as useful 'sorting' and reduces it to an extension of following a verbal or otherwise specific instruction. Even the more general instruction: "Sort these", whilst acceptable in the early stages, deprives the child of an opportunity to deduce the nature of the task from the materials and their arrangements.

To operate effectively as a learning tool 'sorting' must involve the child's *making an active decision every time he allocates an element* to one or other set. It

follows then that a child consecutively taking out and putting together all one kind of object has made (no more than) one initial decision *at the most* and thereafter *is following the instruction implicit* in the activity.

The mature game of 'allocation-to-sets' is played by the child who actively and deliberately allots each individual thing, material, design, etc., from a pool of such elements to one of several sets, guided only by his own judgement as to where it *seems to fit best*, where its presence seems most congruous.

There is no question as to which is the correct place for it or whether the decision fits a previously or presently appropriate definition for the set.

Furthermore, it is not necessary for the child to be consciously aware of the reasons for his choice which indeed later he may abandon, changing his mind as he makes a new decision.

Such changes of mind do not signify '*mistake*' or *lack of judgement*, for every properly made choice or selection represents a decision embodying at least the possibility of increase of experience so that the *allocation of elements* involving multiple 'changes of mind' and redistributions of elements is commonly *more satisfactory from the fundamental learning point of view* than that utilising the *minimum* number of decisions.

Overall achievement of a skill is of little importance to fundamental learning.

In terms of our present example, the child who rapidly and efficiently distributes the elements to their 'proper' sets may have momentarily practised his interpretation of the set definitions but learns little from the allocations. The learning child will have to actively scan over his materials and will frequently seem to be puzzled.

In practice it is often useful to impose one or two additional constraints on the game. For example if cards are used they should be shuffled and presented face down, the rule being that the child takes any card *before* looking at its face, and having looked, must allocate it before lifting another.

If the number of elements comprising each set is restricted - I commonly use nine - the child may be guided by circumstances to search for the most congruous billets for the whole 'universe' of elements despite the prior allocation of many of the elements to individually suitable ones, which do not however fit the pattern seen as a whole.

This is a useful strategy when a child is working within the intermediate stages of 'allocation-to-sets'. Furthermore such a set-up may be used to 'force' the child's recognition of the *set-defining characteristics*, a process underlying the classificatory learning 'tool'.

We have considered very briefly the 'sorting' tool in its fairly mature state.

Now before broaching the business of teaching the child the game and, hopefully, imparting the mental activity of 'sorting', teaching which must be tuned to the individual child's present condition, it is necessary to examine, at least in outline, the

## Evolution of 'sorting' skills in children

In this course we shall have to gloss over much of the earlier stages common to all departments of development and look only briefly at some of the relevant features of second year development.

During the first half of the second year the normally developing child comes to be able to transfer a group of objects *one at a time* from one place to another. Put plainly like that such an ability is taken for granted, yet I consider this to be a major stepping-stone stage of development whose importance cannot be overstated.

As will be readily seen the capacity for transferring things consecutively, and without the to and fro oscillatory behaviour of an earlier stage, underlies almost every complex activity possible. Certainly completing jigsaws, sorting, true 'matching', 'brick' building, drawing and sequencing activities, all require a basic forward inertial tendency or 'continuant' capacity (as I call it). A capacity for 'rectifying' the alternating or oscillatory activity of the earlier stages to a one-way onward tendency.

As a child fixates objects, reaches for, picks up, re-orientates, uses as a tool to act on other things and/or disposes in relation to other objects, he enlarges his store of information about components and combinations of forms, patterns, relationships, directions, behaviours, etc., whilst repeated encounters will in due course lead to the recognition of similarity of aspect, of relationship, of behaviour etc., so that objects may be brought together and compared, and actions 'imitated'.

It is readily seen that children within the second year behave as if recognising the similarity or identity of certain objects or patterns and, of course many such constants are given verbal labels during this period; however the deliberate and verbally unaided separation of objects into sets, even when the members of each set are identical, is very much an early third year behaviour and requires mental maturity far beyond the simple recognition of similarity or sameness.

I should emphasise that in all argument and description I am referring to conditions where no explicit verbal instruction is given to the child, who must derive all information from the materials and their organisation (including in the early stages the behaviour of the teacher in moving things, and sometimes the movements of the child himself when moved passively by the teacher).

Between about 27 months and 30 months the average child comes to be able to guide his 'disposals' between two or even three sets so as to put like with like; however at this stage he tends to amass one set or 'all one kind' at a time. This is quite 'natural' at this stage but, as we shall see, can readily become an obsession with vulnerable children so that it interferes with their reaching the earliest stages of true 'sorting'.

By 30/33 months the child can usually cope with three or more divisions and, with a little moral support, with a fairly large number of elements. It would also be expected that when using sets of identical elements the child would be able

to initiate one or two sets out of three. That is to say if one or two dishes are left empty one or two being 'baited' or seeded with a few elements the child will be able to start off the empty dish(es).

This represents the very earliest or precursor stage of set definition.

About this time (30/33 months) simple similars will usually be separated – e.g. metal keys versus flat buttons versus spherical beads – and, if 'fed' carefully – fairly eccentric elements (e.g. metal strips, plastic discs, marbles) will be more or less confidently allocated to one or other set.

With increasing competence in the use of the sorting tool, the child will be able to deal with larger total numbers, more and more closely similar sets and *in due course* (approximately 48/54 months), as his classificatory powers consolidate, to cope with grossly distracting features as when required to separate according to colour immediately following his separating according to form.

Later (60/72 months onwards) his capacity for coping simultaneously with more than one defining characteristic can be utilised in 'intersection' ('union' and 'complement') sorting. (See later discussion Session Three).

Meanwhile, by 36 months a child is usually ready for introduction to the separation and then true allocation of graphic or drawn designs. These may be conveniently considered as falling into two categories (i) plane graphic designs the sorting of which is wholly analogous with object sorting, and (ii) 'picture references' where it is not so much the designs themselves, as the things, properties, behaviours etc. which the pictures refer to (e.g. flowers, means of transport, limbs, etc.) which are to be allocated.

The levels at and to which such materials can be sorted must depend on the child's discriminative abilities and experience; however the sorting games can in normally developing as well as backward children be used effectively to extend the range and richness of mental associations, to encourage a tendency to freely associate (thus opposing rigidity of thought), and to deliberately indicate to and define for the child characteristics, properties and behaviours virtually impossible to present directly in any other way.

GEOFFREY WALDON  
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