Skills — A Question of Priorities

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It is often assumed that throughout its early history, craft teaching was concerned solely with the imparting of traditional hand skills in wood and metal; but the merest glance through some of the early landmarks in the developing story of craft education suggests that even if common practice . . . was as we suspect, there were those who felt that the practice . . . should be based on sound educational theory.

> Mr. Pestalozzi observes that the received methods of instruction are too mechanical; that children are not sufficiently called into action. Accordingly all his pupils are taught in a way that excludes mere mechanical operations, and certainly tends greatly to exercise their minds. (H. Brougham 1818 p.197).

O.H. Saloman, the founder of the Swedish 'Sloyd' system of hand education maintained that the aim of his course was . . .

> . . . not to turn out carpenters but to develop the mental, moral and physical powers of children. (O. Saloman 1894 p.1).

This concern, that craft education should be considered as an integral part of the child's general education, was given official support in 1895 by the Royal Commission on Secondary Education, when they reported;

> All education is development and discipline of faculty . . . and whether the faculty be the eye and the hand or the reason and imagination . . . the process is rightly termed education. (Bryce 1895 p.135).

From this, one could be forgiven for thinking that the role of craft work in general education was finally established, but it seems that whilst general education was beginning to expand into the 20th Century, craft work in the schools was increasingly being regarded as an educational side show; and this to the point where the Hadow report in recommending elements of a practical bias to the curriculum in the third and fourth years felt obliged to qualify this recommendation by saying that . . .

> . . . it (the bias) should not be so marked as to prejudice the general education of the pupils. (Hadow 1926 p.121).

During its recent history, since Crowther, Newsom and the Schools Council (especially Working Paper Nos. 2, 18 and 26) craft education has been the focus of multitudinous innovations which have appeared with great regularity, having the effect of forcing design education back where it belongs in the mainstream of general education; and it was during the course of these latest developments that I became aware of the concern of many craft teachers as to the traditional role of skill teaching. It is perhaps time to attempt an evaluation of this role and its significance to design education.

The concern seems to centre on the twin aspects of the selection of skills for teaching and the technique of teaching them, and my interest here is to try to arrive at a judgment on the importance of these two aspects in the planning and running of a course in design education. Although they are in fact quite distinct notions it is easy, if one is not very careful, to confuse these two aspects of skill and consequently arrive at erroneous conclusions, and in order that we may be perfectly clear as to the distinctions, I will briefly outline the nature of skilled motor behaviour. For this purpose, two theories may be of value and the first, the stimulus-response sensory motor theory explains our dependence on the five external sense receptors which send information (in the form of electrical potential changes) along nerve paths to the brain, thus informing the brain on the state of the outside world. However it is postulated that a sixth 'kinaesthetic' sense, an internal system that gives information concerning the position of the body in relation to various functions, is the

sense that, in a skilled activity, takes over a lot of the work. Thus a skilled driver locates the gear lever and operates it without the use of his external sense receptors.

A vast amount of information is thus conveyed to the brain and here the central process is carried out in the cortex, which is divided into sensory and motor halves, the sensory cortex having sections dealing with each part of the body. Thus information from a finger travels along nerve paths to the finger section of the sensory cortex.

> In theory at least if we could record all the impulse messages entering the central nervous system in a given period and identify the nerve fibre conveying each of them we ought to be able to extract all the information which reaches the brain from the outside world . . . Diagrams of impulses . . . may be all we need to account for the skilled movements we can make. (Adrian, 1961).

Once the sensory cortex has received the appropriate information, the required signals are switched across to the motor cortex, and from there, impulses are sent along the central nervous system so that on reaching the motor end plate the impulses cause the muscles to contract in short, sharp movements followed by periods of relaxation. This grossly simplified picture* explains the developments of reflex actions which form the basis of our motor behaviour.

> Conditioned reflexes always develop in connection with some reflex already established — so, starting from the innate reflexes, the body is able to build up . . . whole groups of complex conditioned reflexes (Seymour 1966, p.19).

One example of this stimulus response explanation of conditioned reflexes can be observed in the actions of a batsman, who perceives the ball approaching rapidly in a particular direction. The way in which he moves his feet, positions his body, raises his bat and plays the shot in the course of a few seconds would be impossible without a complex set of conditioned reflex actions.

However, this explanation has for some years been considered inadequate as the total explanation of skilled behaviour, and enormous advances have resulted from the adoption of tele-communication theory which suggests that the crucial factor is how that initial perception (of the ball) is made.

In any sensory situation the senses are bombarded by masses of stimuli, the majority of which are disregarded while others are recognised and dealt with i.e. can be said to have been perceived. Perception then is much more than sensation and can be regarded as the meaningfulness that we attach to sensation, and the process involved in that of communication through the flow of information. Information in this sense refers to that which enables decisions to be made or

> . . . that which reduces uncertainty and determines choice. (Seymour 1966 p.27).

That which enables us to select from two alternatives is called a 'Bit' (telecommunication language for Binary Digit) and this *bit* can dispel doubt in the case of two equally probable alternatives.

Information is thus gained by building up a pattern by the use of many *bits* and when signals generate high probabilities less bits are required to dispel doubt. For example, with:— 'IF I SA THAT I DID IT', I am able to fill in the required letter because it was nearly redundant and alternatives are not equi-probable. This redundance of course only refers to skilled operators or in this case skilled readers — and in this sense Kay is justified in maintaining that skill is the ability to obtain maximum information from the minimum of cues, and a skilled person can be said to be the person for whom the largest proportion of signals are

* For a more exhaustive account see W.D. Seymour 'Industrial Skills'.

redundant. It must be remembered that the organisation of perceptual response represents the application to incoming sense data of material derived from the subject's past experinece, and that the meaningfulness attained by reference to past experience is then used to make future sensory input meaningful. This is not the end of the matter, however, as the information is transmitted along nerve paths which have a limited capacity in terms of a maximum number of bits in a second and therefore, as we are continuously bombarded by information from the senses we have to select that which is to be carried, and thus we develop 'selective attention'. If we are about to cross a busy road, we do not take in the colour of the nearby roofs or the noise of a passing train or the smell of a fish and chip shop – all our senses are concentrated on the road, the cars, the speed of cars, the noise they make, the traffic lights, etc. We are, however, even more selective than this as we seldom *perceive* the colour of the approaching car or even its make – unless this be ... significant in our immediate safety (we would probably distinguish a sports car from a saloon car.) So it is only the thousandth part of our visual, tactile and generally sensual field that we actually respond to by back reference to standard patterns of recognition.

Overlooking for a moment the shortcomings of this very brief description of the two theories, what we are concerned with is to what extent the activities undertaken in the craft workshop are dependent on this explanation of skilled behaviour, particularly in view of the common trust evidenced by the use of such axioms as 'practice makes perfect'. Practice in this sense, as in the case of the batsman, relates to the building up of a complex set of conditioned reflexes, so that for example when operating a lathe one becomes very sensitive to the feeding of the tool, and the way the tool is cutting. This becomes even more marked if one examines the processes by which one becomes skilled – the stages of acquisition of a skill – for, to take an example, one of the crucial 'stages' is the determination of the most appropriate sensory channel for each 'bit' of information.

> The first stages of such change (in sensory channelling) are preceded by the recognition of the appropriate locus from which the information is to be derived. (Seymour 1966 p.146).

This change in sensory channelling will provide either the information more immediately or will free an otherwise overloaded channel for the reception of other information. A common example of this phenomena is the switch from visual to proprioceptive channels as observed in the case of the lathe operator, who begins by *looking* for the handles of the cross feed and saddle slide. He then has to *look* at the tool and the work, and to change settings he again *looks* at the handles. The experienced worker does not take his eyes off the work except in unusual circumstances. The location and control of the handles is done with the aid of proprioceptive channelling.

In the light of this understanding of skill it seems that we can easily distinguish the selection of skills from the teaching of them, for whatever the skills we choose to teach, and the choice is in no way defined by the nature of skill, the method of going about teaching them must be influenced by our understanding of skill learning. Thus we could assert that when a child is developing his skill by the most appropriate use of sensory channelling we know we must not suddenly ask him to swap from one machine to another ... that has slightly different controls, for he must be allowed to get to know his machine so as to allow his proprioceptive sense to begin to control his actions. The way in which we organise the workshop and the learning situation therein must always be done with the object of facili-

tating the learning by the student of whatever we choose to teach him, and consequently any understanding of the way in which skills are learnt will be a valuable asset in such organising. The distinction we were concerned with earlier is therefore clearly made; the method used to teach a skill can be best selected with an understanding of how it is best learnt, but what the skill is to be is an entirely separate affair. In no way can the study of skill learning lead us to any conclusions as to *what* should be taught, for any such study must necessarily be concerned with method rather than content, to the way a thing is done rather than what the thing is.

The confusion of these two aspects . . . is most often the result of the assumption that one piece . . . of work necessarily presupposes another, and a most glaring example can be seen in the teaching of Saloman's Sloyd course for here a highly prescriptive course led to clearly specified ends, the student working through a series of jobs each one introducing him to a new technique whilst . . . allowing him to practice those already learnt. The series was . . . deliberately created to control and foster the acquisition of specified skills so that gradually more and more combinations of skills could be used in the making of ever more complex jobs. In this case it can be clearly seen that there is an extension of the method notion and its subsequent confusion with content, such that the method by which the student is to achieve success in a later project becomes the content of the earlier projects. The logic of this method is that if we break down a complex skill into its component parts, teach them separately and then teach the student to combine them appropriately he will achieve success in his later projects. A teacher who adopts such a position might claim that as one course of work presupposes another, in order to be able to do XYZ in the 5th and 6th form, the students must have the skills of ABC established in the 1st and 2nd year. Could one not claim that in order to make go carts in the 5th form, the junior students require a skills course in such things as welding, brazing and threadcutting, or that in order that they may be able to make cabinets in the 5th form, the 1st and 2nd years must be taught to cut dovetails? Such reasoning leads to the first and second year course being composed of an agglomeration of skills, all of which are to be of value later on.

My point is that, as we have seen, there is nothing in the nature of skills that allows one to decide whether or not this is a justified course of action, for its rightness will hinge not on the skills themselves but on two other factors. Firstly is such a course the best way to prepare the students for the later projects, be they go carts, cabinets or whatever; and secondly are such projects themselves an appropriate focus for a design course? The 'skills' course in such a situation is now more correctly called a 'go cart and cabinet skills' course, and its justification depends on how well it prepares students in the building of go carts and cabinets, and on whether they (the go carts and cabinets) are justifiable projects.

The answer to the first question is a complex psychological one, involving a study of how children learn skills, how best they can be taught to apply the skills, how they are most easily motivated, and much more besides, but however well it can be shown that the course prepares students for the building of go carts, the justification of doing so is a philosophical one involving the education aims of the school. This follows from the difficulty of distinguishing what the aim of a design course should be, for any teacher seriously asking the question is involved in debating the changes or developments in the child that the teacher believes could contribute . . . to the general education of that child, and to make such a decision the teacher needs to be clear as to the general educational aims of the school.

The purpose of this discussion has been to decide on the priority position of skills amongst the other considerations relevant to founding and running a course in design education, and I feel confident in stating that the selection and teaching of skills can never be accorded primary or even secondary importance in any hierarchy of considerations. The primary concern is the educational aims of the school, the ways in which the school feels the child should grow and develop during his schooling. From this the department can decide on its aims, on the ways it can contribute to the achievement of the school aims within its specific area of influence, in our case the workshops, tools and materials; and it is then possible to formulate a course of work that can reasonably be expected to lead to the achievement of these departmental aims. Once all this is decided it may then, and only then, be appropriate to examine what specific skills may be required by the students for that course of work, and following that one could debate the psychological matter of how they should best be taught.

Ultimately then the justification of any course of work lies in the aim to which the course is leading. If the aim is inappropriate then the work which leads to it is likely to be equally inappropriate, but any discussions of its value cannot hinge on the value of the operations carried out because that value is specific to the aim of the course.

Any discussion of the skills that should be taught in a design course is ultimately a discussion of aims.

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