

can be solved creatively and imaginatively. Certainly art can be logical and have a well-developed structure. It is even possible to study the structure of art forms using the logic of information theory (Mueller 1967). Only rarely can one find an instance in the real world outside the psychologist's laboratory when one kind of thought is employed in isolation. The mode of thinking employed is obviously very much dependent on the nature of the situation. Most writers have concentrated on two main related factors, the thinker's relation to the external world, and the nature of the control exercised over those thought processes.

Murphy (1947) suggested that mental processes are bipolar, being influenced both by the external world and by inner personal needs. In his study of personality he was particularly interested in the individual's susceptibility to these two influences, and the resultant predominance of certain thinking styles which could be observed in the individual. The normal person is rarely entirely pre-occupied by either one of these influences for any amount of time but, rather, alternates between the two. It is, however, possible to identify conditions under which one would expect the normal person to attend more to one influence than the other.

Problem-solving obviously requires more attention to the demands of the external world than to inner mental needs. In imaginative thinking, on the other hand, the individual is primarily concerned with satisfying inner needs through cognitive activity which may be quite unrelated to the real world. This seems to offer a psychological distinction which parallels that between design and art discussed earlier. Design is directed towards solving a real-world problem while art is largely self-motivated and centres on the expression of inner thoughts. This does not mean that imaginative thought can be excluded from the design process but that its product will probably always need evaluation by rational thought in order that the designer's work should be relevant to the real-world problem. The control and combination of rational and imaginative thought is one of the designer's most important skills and we shall discuss this crucial issue further in Chapter 9.

Thought and personality

A very popular approach to the study of human intelligence is represented by the factorial school. This work holds that human intelligence is not a simple factor but rather a whole series of related

factors each of which may be present to greater or lesser extents in any individual. In his review of such work Guilford (1956) concluded that intellectual factors could be divided into the two major groups of thinking and memory. The thinking factors, which are of most interest here, Guilford further subdivided into cognition, production and evaluation.

The cognition factors of human thought have to do with becoming aware of and understanding classes of objects or ideas. This analytic ability to classify and recognise is of the utmost importance in everyday thought. For example, it would not be possible to study the differences between the structural systems employed in Romanesque and Gothic churches unless one could first recognise and classify such buildings. Guilford maintains that there are three ways of developing such a class system depending on whether the figural, structural, or conceptual content is used. Thus one might recognise a class by its figural properties. Children may initially recognise all four-legged animals as cows and only later look for further detail such as horns or tails. The second system of class recognition, by structural content, requires some functional relationship to exist between class members such as in the 'complete the series of symbols' type of IQ test question. Finally, one might recognise a class conceptually, such as architects or lawyers as being a group of people having passed certain examinations. For Guilford, then, these cognition factors influence our ability to define and understand problems whether they are to do with the appearance, function or meaning of objects. As Guilford himself points out, problems of figural and structural types abound in design and the ability to discriminate figural and structural classes is likely to be important to the designer.

Guilford's second group of thinking factors is concerned with the production of some end result. 'Having understood a problem we must take further steps to solve it' (Guilford 1967). Just as Guilford's cognition factors deal with the ability to recognise figural, structural and conceptual order, so the production factors hypothesise our ability to generate or produce these three kinds of order, but he found that the reality was not quite as neat as the model suggested:

In the investigation of planning abilities it was hypothesised that there would be an ability to see or to appreciate order or the lack of it, as a feature of preparation for planning. It was also hypothesised that there would be an ability to produce order among objects, ideas or events, in the production of a plan. A single ordering factor was found.

(Guilford 1967)