PIAGET'S THEORY: A PSYCHOLOGICAL CRITIQUE

By Geoffrey Brown & Charles Desforges

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A Psychological Critique

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Chapter 1

Piaget and theories of development

As a prelude to evaluating Piaget's theory we raise some general issues about the problems of accounting for cognitive development, and contrast Piaget's stance on these issues with those adopted by other authorities.

Many of the differences between a newborn infant and a two-year-old child are obvious. The elder child is bigger, more mobile, less dependent, has a wide repertoire of physical skills, can communicate many of his needs, has tastes, opinions, attitudes, favourite people, remembers a range of facts, names, times and promises and responds in elaborate ways to approaches made to him by others. Despite his achievements, however, he is a social, emotional and intellectual novice when compared with a four-year-old. The theorist working in developmental psychology seeks to explain these dramatic, age related changes.

In this undertaking a number of perennial issues are met. If some account is to be given of the changes as development proceeds then it is necessary to have detailed and accurate descriptions of the achievements at certain reference points. This in turn entails making choices about which part of the child's extensive behavioural repertoire to describe since it is unlikely that any exhaustive description could be possible. Given these necessarily selective descriptions of developmental attainments the theorist then has to consider how development proceeds. Will the acquisition be seen as gradual accumulations of experience or as abruptly appearing achievements, and, as a related issue, are the attainments of the four-year-old *qualitatively* different from those of the two-year-old or are they simply *quantitatively* different? Is the four-year-old's language, for example, more of the same kind of language that the two-year-old exhibits or is the elder child in possession of a radically different mode of communication? A fourth problem in accounting for development requires that the theorist explain the differential role of innate and experiential factors and of their possible interactions. How far is the child's mode and level of intellectual functioning biologically determined at conception? How do particular life experiences interact with biological factors to enhance or limit the production of behaviours?

These problems of describing and accounting for developmental change are inter-related in complex ways. The selections made will not be random. The theorist will observe those specific behaviours which are felt to be most related to the problem he has in mind, and the conception of the problem will be informed by his stance on the nature/nurture debate, or on whether he conceives development to be a gradual and continuous accumulation of behavioural elements or a discontinuous, stepwise process of emergent functions. Of course the reverse process of influence is also true. Not only does our conception of development inform the kinds of data we select to solve problems of theory, the subsequent descriptions of behaviour in turn constrain our view of how development proceeds.

Put bluntly, the conception of a problem necessarily informs the selection of the data chosen as pertinent to the problem and selective and limited data necessarily constrain the subsequent view of the problem. In what follows, this point will be illustrated again and again. Whether, in the process of building theories of development, the above describes a vicious circle of self confirmation or a growing spiral of understanding, we set aside for the moment.

The nature of theory

In common usage, the term 'theory' has a number of more or less vague connotations. It may imply a hunch, 'my theory is the butler did it' means that the story so far leads me to believe that the butler is the most likely culprit of some crime. Speculations less directly linked to facts are often termed 'theories'. We see a friend getting fatter and 'theorise' or 'speculate' or 'suspect' that they are anxious, because we know from past experience that this friend eats a lot when snowed under with work and we take this excess eating to be a consequence of anxiety. This dual role of summarising and accounting for facts is entailed in the word 'theory' both in its common sense and formal-scientific usage. Equally, common sense distinguishes between good and bad theory or speculation. Good speculation is, quite simply, speculation which 'comes true'. Scientific theory is similarly demanding. Good theory is theory from which accurate predictions and adequate explanations can be made. One final distinction made in common usage is between promising theory and unpromising theory. There are lines of argument or procedures for making predictions about winning on a fruit machine or betting on horses which, whilst in the short term are not producing satisfying outcomes, none the less look sufficiently worthwhile to polish, amend slightly or persevere with. That is, there are theories which, for more or less vague reasons, we go along with because we believe they can be improved. Scientists also recognise that new theories may be temporarily unsatisfactory in terms of predictive and explanatory capacity but if, for other reasons, the theory looks promising, then it may be subjected to rigorous procedures of amendment.

A scientific theory is a conceptual tool used to describe and predict efficiently, and explain adequately, a given set of phenomena. The set of phenomena may be extremely limited or highly complex. We can contrast, for example, the problem of describing the increase in children's height with age against that of describing the increase in intellectual competence with age. Height is readily conceptualised and can be represented by a single quantity on a single scale. But what constitutes 'intellectual competence' and how is it to be represented?

If describing a set of phenomena is daunting, the question of 'adequately explaining' the set is even more so since theorists must offer not only a definition and representation of the phenomena but also make those statements that allow the description to be tested as an explanation. In science such tests tend to require empirical work. Thus a scientific theory takes the form of a proposition or set of propositions from which empirically testable hypotheses can be deduced.

Some problems in building and evaluating scientific theories

A necessary preliminary to appraising a theory critically is the identification of a set of criteria by which theories may be judged. Building and evaluating theories entail much the same kind of issue and procedure. A good theory is a growing theory; it has an ever extending range of application. Theories rest on data and data are generated by research. Thus a theory must be a rich source of hypotheses. These hypotheses must not be vague or indicate ambiguous outcomes; they must be empirically testable, i.e. potentially falsifiable. A good theory is usable, therefore it must be as parsimonious in terminology as is consistent with the power to explain. Testability entails that a good theory be internally consistent. For example, the definition of each term or relationship must not be a contradiction of the definition of any other term or relationship. These criteria, breadth of application, testability, parsimony, internal consistency and richness as a source of hypotheses, are each complex in themselves and related to each other. Below we expand on some of them.

The matter of judging the quality and progress of scientific theory is complex. Our discussion is necessarily brief and points only to the kinds of ideas which have guided our thinking on Piaget's theory. For more extensive discussions see Keat and Urry, 1975; Koch, 1959, 1974; Kuhn, 1970; and Lakatos and Musgrave, 1970.

Breadth of application

A theory may apply to a very limited set of data or it may be more general. Skinner's account of operant conditioning applied in the first instance to the behaviour of pigeons in specially constructed boxes but has since been used to give accounts of wide ranges of animals and human behaviour including the acquisition of language. This growth in the breadth of application of a theory is a manifestation of the generality of the concepts identified as fundamental. The concept of reinforcement, for example, has been shown by Skinner and his colleagues to be of quite general application. The generality of concepts cannot be judged in advance of their use. As a consequence, the more a theoretical proposition is applied and the more it seems to be sustained as useful, the more we assign it general significance.

There are no yardsticks for judging 'breadth of application'.

Testability

We have noted that we demand of a scientific theory that it can be used to generate predictions. Our degree of confidence in the validity of the theory is proportional to the degree to which these predictions are testable, i.e. informative. There is no point in generating predictions which are untestable. It is less than ideal to have predictions which are not potentially falsifiable. If a theory can be used to predict all possible outcomes of a situation then we are no better for having the theory than not. Such predictions carry no information value. A theory should be able to predict the presence of some outcomes and the absence of others. In this view a useful hypothesis is one which is, in principle, falsifiable.

The notion that science makes progress via theoretically based conjectures and empirically based refutations is not without problems and not without its critics. Suppose a hypothesis generated from the theory proves to be false. Do we reject the whole theory? Do we question those concepts used to generate the hypothesis? Do we treat it as measurement error? In testing any hypothesis there are probably many other hypotheses implicit in our measuring instruments or data analysis procedures. Could it be that one of these has been falsified? Clearly it is very difficult to know what to make of particular acts of falsification. This is not to say that falsification is an irrelevant criterion, rather that it is a very difficult notion with which to work.

There is the view however (Feyerabend, 1970) that progress via a process of conjecture and refutation is unnecessarily slow. In this view the essence of progress is industry. Sheer quantity of empirical work generates data which can be scrutinised for generality.

Parsimony

If we have a set of data or phenomena which we seek to describe and comprehend it seems self evident that the more rendered down the description is the more easily it can be accommodated intellectually. Of course this rendering down must not result in a loss of complexity or accuracy. By representing all forms of matter in terms of atoms the physicist has a very parsimonious way of describing a wide range of properties of matter and related phenomena such as magnetism and electricity. Additionally, this representation can readily be manipulated symbolically to explore relationships not amenable to inquiry if the concrete form of representation were the limit of our description.

Parsimony is related to breadth of application. The greater the range of phenomena that can be accommodated by a limited number of concepts the more powerful and efficient is our mode of representation. There is no absolute scale of parsimony. A theory can only be judged parsimonious in respect of other theories claiming to account for the same data. Equally, whilst efforts are made to remove redundant concepts in a theory and sharpen the definitions of others, there is no 'ideal' number of concepts to be striven for. Any appeal for parsimony must recognise the considerable complexity of the problems social science theories deal with. Simple theories are to be preferred to complex theories only when they are equally valid and general.

Fruitfulness

We have noted earlier that a good theory is a rich source of empirical work. This is so, but the proviso to be emphasised is that the work must be productive–it must have implications for the development of general theory. Industry is often confused with productivity. The advent of information processing theories in cognitive psychology has led to a massive surge in research but critics have recently noted that the majority of this work is not making a contribution to theoretical progress (Allport, 1975; Newell, 1974). The work is said to have become 'phenomena driven' rather than 'theory driven'. It seems that the theory is not amenable to direct, empirical investigation and as a consequence the data gathered have little clear implication for the development of theory.

Assessing Piaget's theory

In the above sections we have commented on the kinds of question one must ask of a scientific theory. None of the questions demands an absolute answer. Theories are judged in some respects with reference to competing theories. In other respects they are judged against our sense of scientific progress. In subsequent chapters we shall look at Piaget's theory in detail with such issues in mind. In the second half of this chapter we endeavour to locate Piaget's theory in the context of other views of intellectual development. In that section we focus on the issue we first nominated, that is the problem of making choices about the kinds of question to ask and the kinds of data to select.

Contrasting approaches to cognitive development

Bryant (1971) identified three approaches to cognitive development. There are those which focus on perception, those which emphasise the development of language and those which study logical development *per se*.

The work of Bower, 1974; Fantz, 1964; and Gibson *et al.*, 1962 exemplifies an approach via the study of perception. In this view it is suggested that the infant is born with certain abilities to distinguish shape, distance and colour. Development consists of gradual changes from relatively simple codes for the identification of incoming data, to more sophisticated ones as a result of experience. The task of the developmental psychologist is then to determine exactly how the new distinctive features of stimuli come to be apprehended and learned.

The effects of language acquisition have been emphasised and studied by workers of quite different orientations (e.g. Vygotsky, 1962; Kendler and Kendler, 1962). In different ways both attempt to explain how language provides a symbol system which enables the child to develop from direct and immediate responses to specific stimuli towards a mediated form of behaviour which is more flexible and adaptive.

Piaget's studies examine the transition from immediate action to more reflective, logical processes. We shall describe his account in detail in Chapter 2. For the moment we note that each authority has selected a focal problem in the analysis of cognitive development which indicates a view of what is significant in this process. Furthermore, it will be shown that each has a theoretical position which implies or expresses a stance on the role of inherited characteristics, on the nature and use of experience and on the distinction between development as a qualitative or quantitative change.

Cognitive development and perception

Perception is concerned with the processing of data acquired through the senses. By far the greatest volume of research in this field has concentrated upon the visual sense, and this will be used in this section.

It has been demonstrated that very young infants possess some significant perceptual processes. Fantz (1964) has shown that at the age of five days they are able to distinguish certain common configurations of patterns, such as a human face, from stimuli containing the same pattern elements but in a scrambled form. The author was not arguing that there was an innate tendency to recognise the face, but that patterns with close similarities to social objects had properties identifiable to a newborn child.

Bower (1974), using infants of only a few weeks old, also demonstrated several perceptual competencies. Amongst them was the ability of the infant to discriminate between a small object moving close to the face and a larger object moving toward the face but from a safe distance (see Fig. 1.1). Even though both objects produced the same size image on the retina the infant only made a defensive reaction to the small, close object.

It is open to conjecture whether such perceptual abilities are present at birth, or whether they are learned very quickly indeed. There is no doubt, however, that the infant seems to have a considerable repertoire of perceptual skills. The manner in which these perceptual skills become modified during childhood has been the main interest of E. J. and J. J. Gibson. They argued that the young child tended to discriminate

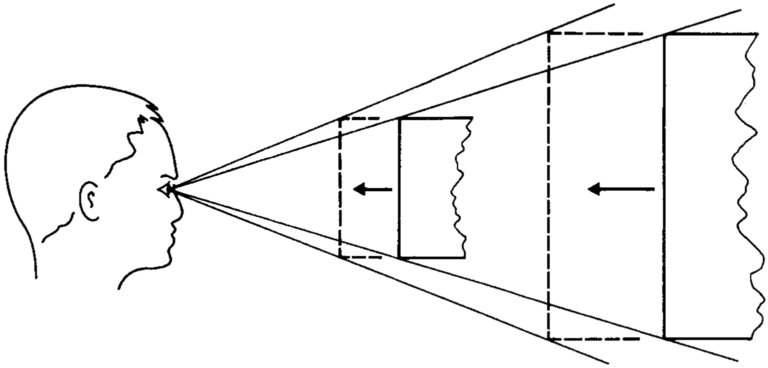

Figure 1.1 *Same size retinal images projected by objects at different distances (adapted from Bower, 1974)*

along a few dimensions which have particular relevance for him. Over a period of time other dimensions become relevant, and are incorporated into his perceptual processing. Typical of their experiments was that using the matching task shown in Fig. 1.2. Children of four and five years tended to match according to shape, irrespective of orientation. By the age of seven to eight years this additional feature had been added (Gibson *et al.*, 1962).

Spatial orientation is thus seen as an important development in the child's perceptual processing. Initially it has little relevance, they argue, because the fundamental acquisition of the notion of object permanence does not depend on orientation. That is, the child learns that Mummy remains the same Mummy whether she is far off or close at hand, and whether standing, sitting or lying down. Only when the child is faced

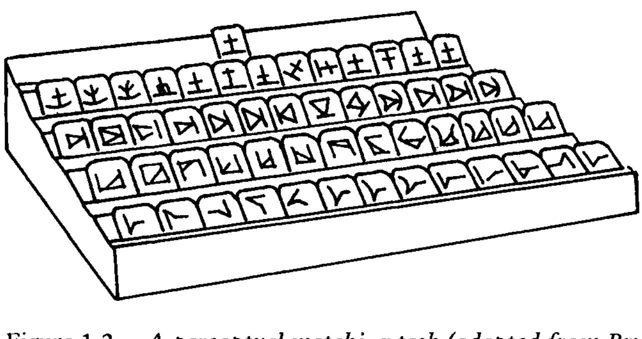

Figure 1.2 *A perceptual matching task (adapted from Bryant, 1971)*

with a new demand, that of decoding written symbols, does orientation become a salient feature, for only then does it actually alter the meaning of the perceived object.

This theoretical emphasis upon the perceptions of the child takes its evidence from his behaviour in specific tasks. However, it seems unlikely that the child of four years really fails in all situations to perceive orientation as relevant. He does not often try to feed the wrong end of a teddy bear, nor does he attempt to balance bricks or boxes without orienting them first. Bryant (1971) suggested that the complex array led to a selection of what could be remembered, not what was perceived, in the Gibsons' experiment. Analysis of his own experiments suggested that the failures were indeed in the ability of children adequately to represent orientation in memory, and were not indicative of the salience of certain features.

This does not invalidate the 'perceptual' approach by any means, though it does suggest that the emphasis should be placed upon researching the reason why some stimulus dimensions are more readily coded than others, and the manner in which new codes are developed. Thus the theoretical approach in which perception was given pre-eminence would seem to have been superseded by one studying the cognitive processes which give rise to the behaviour in perceptual tasks.

As a theoretical approach the perceptual studies fulfilled many of the criteria specified earlier. The basic thesis that the child's reactions to the environment would best be analysed through study of his perceptual processes is both plausible and logical. The predictions that his behaviour in perceptual experiments would provide indices of developmental trends, and that the introduction of new trends would be concomitant with new demands made by the environment, could be operationalised and tested. The weakness of the approach lay not so much in the invalidity of the claims as in the realisation that behaviour on perceptual tasks, and the very act of perceiving itself, is better construed as a cognitive process, of which sensory input and discriminatory behaviour are only a small part. The crucial aspects of processing appear to lie in processes which transform sensory input and give it meaning, and which then generate behaviour.