

the two volumes of the social dimension present a comprehensive survey of the major developments in social psychology which have taken place in Europe during the past two very active decades. They aim to capture the diversity and vitality of the discipline, stress the growing emphasis on fully social analyses of social psychological phenomena – hence 'the social dimension' – and to provide a valuable resource for researchers in the future.

Although comprehensive in scope, the volumes are not written in the formal style of a reference handbook. Instead, the authors of the thirty-three chapters, drawn from more than a dozen mainly European countries and all experts in their own fields, were invited to present their own personal overviews of the issues in social psychology on which they are actively working. Both volumes are organized into three main Parts. Volume 1 is concerned with the social development of the child, interpersonal communication and relationships, and the social contexts of individual actions; while volume 2 covers representations of social reality, group processes, and intergroup relations.

This ambitious enterprise has produced a distinctive yet authoritative summary and evaluation of the growth points of social psychology in Europe in recent years which will interest and influence not only social psychologists but many readers from related disciplines.

Les deux volumes de *La dimension sociale* présentent une étude d'ensemble des plus importants développements en psychologie sociale dans l'Europe de ces deux dernières décennies. Ils tendent à saisir la diversité et vitalité de cette discipline, à souligner l'importance croissante du phénomène psychosociologique sur les analyses sociales globales – de là, la 'dimension sociale' – et à mûrir d'un outil précieux les chercheurs de demain.

Bien que d'une large portée, ces volumes n'ont pas le style rigide d'un ouvrage de référence. Tout au contraire, les auteurs de ces trente-trois chapitres, originaires de douze pays pour la plupart européens, et tous experts en leur domaine, ont été invités à présenter leur point de vue personnel sur les problèmes auxquels ils se consacrent. Les deux volumes sont divisés en trois grandes parties. Le premier traite du développement social de l'enfant, des relations et communications interpersonnelles, ainsi que du contexte social des actions individuelles. Le second volume couvre les représentations de la réalité sociale, des comportements de groupe, et des relations inter-groupes.

Cette ambitieuse entreprise a mis au jour une somme remarquable qui précise et pèse les divers progrès de la psychologie sociale en Europe. Elle fait déjà autorité et influencera non seulement les psychologues sociaux, mais aussi, dans les disciplines apparentées, de très nombreux lecteurs.

Cover design by Richard Senior

EUROPEAN STUDIES IN SOCIAL PSYCHOLOGY

# THE SOCIAL DIMENSION Volume 1

Edited by Henri Tajfel

1982

## 4. Learning: a social actualization and reconstruction of knowledge<sup>1</sup>

ANNE-NELLY PERRET-CLERMONT, JEAN BRUN, EL HADI SAADA  
AND MARIA-LUISA SCHUBAUER-LEONI

### 1. Cognitive and psychosociological processes: difficulties in relating them

In psychological debates, the field is often divided by a border between what is deemed 'internal' and what 'external'. This division risks simplifying certain questions of research by placing researchers who have demonstrated the existence of individual processes (considered as 'unique to the subject') against those who have found evidence for social processes (so-called 'external determinants'). In order to situate the gist of this debate, as well as our object of study, we shall outline this dilemma.

For some, the individual is the primary object of study. He<sup>2</sup> is considered as having his proper identity, abstracted from its social context. He is the source of all his elaborations (especially cognitive), and the determinants of his behaviours are to be found in their biological origins and the individual's own experience. While allowing that social factors may have an influence, this perspective imbues them *only with the status of supplementary variables*, liable to affect individual behaviours yet not constitutive.

For others, the individual is but an element of a larger phenomenon: the social group. It is the group which gives meaning to the individual behaviour of its members by its collective representations, norms, roles and the structures it imposes. While admitting inter-individual differences, the adherents to this perspective tend to consider them to be only the result of *statistical fluctuations* or part of the variance which remains to be explained by other social processes. The individual is the actor of 'external' determinants.

This sketch is perhaps something of a caricature but rarely is the individual considered *simultaneously* as being engaged in a psychological activity of

construction of meanings *and* as a member of a social group which conveys models of comprehension.

In the domain of cognitive psychology, the subject's behaviour is most often examined in individual terms, despite the fact that the experimental paradigms used always stage<sup>3</sup> particular social situations with predetermined social agents. These elements are not considered as such in most of the theoretical conceptualizations referred to in cognitive psychology: however, several studies have shown the importance of these relational contexts. For example, Katz (1970, 1973) and Labov (1972) have both demonstrated that social characteristics of the interlocutor play an important role in the determination of the modalities and quality of the subject's performance. Rose & Blank (1974), and McGarrigle & Donaldson (1974) have demonstrated differences in the performances of the subjects, varying in function according to what could be interpreted as differences in the experimental 'scenarios'. Light, Buckingham & Robbins (1979) have also presented data illustrating similar context dependency of performances. These studies all show that evaluation of a subject's competences is dependent on, or affected by, the characteristics of the testing situation itself.

Examining the effect of adult counter-suggestions made to children during Piagetian clinical interviews, several experiments have shown that the simple fact of presenting an opposing point of view to the child is capable of inducing progress on operational tests (Lévy 1981; Mugny, Doise & Perret-Clermont 1975-6; Mugny, Lévy & Doise 1978). Researches concentrating on clinical descriptions of cognitive processes have sometimes incidentally described analogous phenomena (see, for example, Comiti *et al.* 1980). Similarly, Schaffer (1979), in his studies of mother-infant relations, has shown the extreme interdependence between the child's first interest in objects and the reactions of his mother in a given situation (see also this book, Chapter 2).

We have chosen these examples to call attention to the impossibility of describing and evaluating the cognitive competences of a subject without considering the social context which elicits their actualization. The failure to consider the social and the micro-social context of data collection leads to the construction of a *social abstraction of the individual* which attributes perceived differences in behaviours to individual characteristics, and which consequently neglects their social significance.

For those who are interested in education, in all of its complexity, it is useful to keep in mind that cognitive behaviours cannot be reduced to individual autonomous psychological processes. The individual is nourished by a culture

<sup>1</sup> This chapter was written with the collaboration of Nancy Bell, François Conne and Michèle Grosse, and was translated from French by Nancy Bell.

<sup>2</sup> For the sake of simplicity, we will consider the pronoun 'he' as generic.

<sup>3</sup> In using this term we are referring to Goffman's approach (1959) to the presentation of self.

and an education conveyed to him by the various social groups with which he identifies and must remain in communication. The subject is constantly solicited in his cognitive and emotional life by particular social demands inherent in the coexistence with others: conversations, interactions, exchanges, negotiations, etc. However it does not suffice simply to state that the individual is inserted in a field of social relations. The mechanisms and processes of these subject-environment exchanges must be specified. Studies whose methodology has been inspired by ethnology have evidenced the interplay between the structuration of the subject and the specific social and cultural demands of the context.

The observation of cognitive exchanges between dyads has shown that the development of communication and thinking obeys certain cultural rules which structure conversation (Cook-Gumperz & Gumperz 1982). Only by grasping the presiding cultural rules of these exchanges can the researcher understand their meaning.

Ervin-Tripp (1982) has observed, in her studies of the evolution of strategies of comprehension of others, that the implicit or declared intentions of others do not play a large role in the child's comprehension of the situation. His comprehension can only be explained by reference to the social experience that the child has acquired in his specific environment.

When psychology establishes developmental scales, or hierarchies of stages, for subjects of different social and cultural backgrounds without taking into account these rules which regulate social relations (including tester-*testee* relations) it inevitably unconsciously biases the evaluation of the behaviours of others.<sup>4</sup> One could well wonder if these biases are not always sociocentric, that is to say, biased in favour of the researcher or his own membership group.

We now know that it is impossible to render a test 'culture-free'. But the testing situation is itself also socially marked. The performances of the partners in this situation can not be understood independently of their social significance (Donaldson 1978). It is likewise evident that an analysis formulated uniquely in terms of social marking is not sufficient for an exhaustive explanation of individual performances. It is the interplay of these social processes with psychological ones which interests us.

We will therefore examine the contributions of recent studies which permit an articulation between these different levels of psychological and sociological

4 The existence of close correlations between cognitive performances and social or cultural origin has often been reported (see, for example, Bruner *et al.* 1966; Coll, Coll & Miras 1974; Dasen & Heron 1981; Doise & Mugny 1981a; Haroche & Pêcheux 1972; Perret-Clermont 1980; Perret-Clermont & Schubauer-Leoni 1981). But some such studies also report that the cognitive hierarchies observed are liable to change noticeably when the characteristics of the testing and/or educative situations change.

analysis. We will first centre our attention on the social conditions of the subject's elaboration of a particular type of competence, namely operator notions (as Piaget defines them). We will then turn to educative situations: can the psychosocial processes described in explaining the acquisition of operational competence in laboratory-type settings aid the understanding of the socio-cognitive dynamic of the school-teaching setting, i.e. the conditions in which culturally constructed knowledge, mathematics for example, can be successfully transmitted to the individual?

To comprehend the dynamics of situations which elicit cognitive development of the participating subjects necessitates theoretical references besides those of the psychology of intelligence. We wish to link the necessary description of the processes of thinking to the relational processes which elicit them. This requires, beyond cognitive psychology, contributions from other disciplines, including social psychology, ethnology, sociology. It is therefore a question of finding the theoretical and experimental means to integrate the study of the 'internal' cognitive dynamic of the individual with that of the 'external' factors, such as social environment, task, etc., which affect it, remembering that the attribution-making individual always interprets these external factors, giving them particular meaning according to the context.

Our object of study is learning. But we postulate that learning does not take place in a social vacuum, nor does it happen in a cultural desert where all has to be re-invented by each individual. The context of cognitive development is marked institutionally, culturally, historically.

We are interested in learning as a *signifying* activity, not only for the researcher or teacher observing the pupil, but also for the learner himself in his search for mastery or comprehension. The different partners of the experimental or didactic situations may tend to attribute different meanings to these situations: the study of these 'misunderstandings' is an intrinsic part of our study. Rather than considering them as artifacts, we will examine by what 'art' shared social meanings are constructed.

## 2. The learning of operator responses

2.1. *Learning to construct a response.* For many subjects, taking an operator test is probably already, in itself, an occasion for learning. In the course of the experimenter's questioning the individual finds himself confronted with the need to understand the situation, to produce a behaviour and to formulate a response.

How are psychological and social processes articulated in learning phenomena which can be considered as the adoption or the elaboration by the

subject of meanings and responses? We have described elsewhere (Perret-Clermont & Schubauer-Leoni 1981; Perret-Clermont *et al.* 1982) how such experiments, whose purpose was not to induce learning but to test subjects' competence levels, have nevertheless induced learning because of the psychosocial dynamic of the testing interaction. We would expect to find the same type of processes in experiments expressly designed to elicit learning or to observe development.

**2.2. Testing and learning situations.** In a given learning situation an individual constructs a response. In so far as this response is new, one can say that he 'learns' it. This learning was observed even when such was not the intention of the tester. It seems useful, however, to make a distinction between *testing situations* which are designed as such by the researcher (psychologist or teacher), who wishes to assess the subject's level of behaviour at a given moment, and *learning situations*, which are constructed in such a way as to give the subject temporal and relational space in which to explore reality, gather information and try out his behaviours and responses with the aim of attaining a superior state of knowledge.

Testing situations are marked by evaluative finality and the subject's responses are elaborated toward this end. We suggest that nearly all learning situations are likewise marked. In so far as all behaviour is, to a certain extent, a 'response', i.e. the result of an interaction with the social environment, it is clear that didactic situations can be considered as essentially analogous on many levels to testing situations. However, the social interactions which accompany didactic situations differ in significance and explicitness and vary in their relative importance.<sup>5</sup>

The tester guides the situation and expects acceptable responses in a relatively brief period of time. The eventual long-term learning consequences for the subject of the testing itself are neither investigated nor even considered by those desiring to establish a diagnosis. Yet with regard to research on learning, it is precisely these long-term effects which are expected and which will be evaluated, though sometimes without the subject being explicitly informed of the nature of these expected effects! This can be considered as another way of neglecting the role of the subject's activity in the construction of meanings.

Elsewhere we have discussed these distinctions in referring to individual situations (Perret-Clermont *et al.* 1982). Here we will consider the study of

<sup>5</sup> It would be desirable to examine how subjects perceive testing and learning situations as a function of their past history, social interactions and experience: do they make such a distinction between the two contexts?

collective performances in order to illustrate these questions. Moscovici & Paicheler (1973), in their review of literature on the subject, have already shown that it is not possible to establish a superiority (or an inferiority) of collective performances *per se* with regard to individual performances. In fact, the quality of collective performances depends upon a number of processes, e.g. the relation of the communication network to the structure of the task, the existence of an isomorphism between social relations and exchange network, etc., which cannot always be optimized for greater group performance.

Studies of children's cognitive behaviours have shown that, according to the circumstances, collective performances can be more advanced, in the sense of being more logically structured, or can be equal or inferior to individual performances (often in the same experiment), depending on the experimental, psychological and sociological conditions of subject groups studied (see, e.g. Bearison 1981; Doise 1973; Doise, Mugny & Perret-Clermont 1975; Mugny & Doise 1979).

In two studies, Russell (1981a, b) has observed that performances of child dyads are not always superior to individual performance and that 'when dyadic superiority did result in these studies it was by virtue of the influence of one child's correct judgement'. Russell explains this by 'the notion that incorrectly judging children tend to adopt a correct partner's answer, rather than by the notion of socio-cognitive conflict' (Russell 1981b: 160). But how does the subject come to recognize the partner's answer as correct and to accept it? We suggest that 'conflict' should be taken in a larger sense than Russell's so as to include the simple confrontation of two distinct opinions.

Above all, these researches point to important questions: how do subjects function intellectually when they 'realize' their responses are incorrect, and how do they *validate* their intuitions? To speak of a 'correct' or 'incorrect' response presumes the existence of a norm of correctness: what are its criteria? How does the subject appropriate them? What material, cognitive or relational aspects of the situation does the subject take into account in order to respond 'logically' to the problem, i.e. 'logically' in the eyes of the psychologist?

Although Russell has not done so in the two experiments cited, it would be interesting to examine the important differences that can be said to exist between various situations of socio-cognitive conflict by studying their long-term cognitive *consequences* for the participants. What effect would a confrontation with a differing response have on another situation at a later time? For a number of epistemological and methodological reasons, it is neither pertinent nor possible to resolve the general question of the possible

superiority of individual or collective situations with regard to the cognitive performances of participating subjects. On the contrary, an examination of the long-term effects of collective situations could prove to be particularly illuminating for the understanding of the dynamic of the cognitive processes which produce these observed performances. This is what we will now discuss.

2.3. In what circumstances do collective situations have long-term consequences? Simple co-presence or any form of work in small groups, e.g. dyads or trios, or large groups, e.g. teams or classes, represent, at least potentially, an occasion for social interaction. The possible modalities of collective work are numerous; one could even include in the definition of 'collective situations' those in which the presence of another is simply invoked. Yet, the precise cognitive repercussions of these collective situations on their participants have rarely been studied and they are likely to vary considerably. Here we will centre our attention on several experiments with children which have examined the possible effects of social interaction between two or three individuals on participants' performances on operator tests.

Several of these studies have an explicit didactic purpose of eliciting learning, while others aim to observe a development. But they are all characterized by the fact that they are concerned with 'closed' problems, i.e. problems to which the experimenter holds the 'correct' solution (in terms of logical norms), and not 'open-ended' problems (such as those investigated by scientific researchers and described by Latour & Woolgar 1979).

These studies have diverse theoretical references as well as differing experimental procedures: some are concerned with group work, others consider more limited examples of social interaction, such as a simple confrontation with a model. The results of several of these studies are interpreted by their authors in terms of social learning theories (Bandura 1971; Rosenthal & Zimmerman 1978). Extending the hypotheses advanced by Smedslund (1966) and others about the social origin of decentration, other authors (Doise & Mugny 1981a; Doise, Mugny & Perret-Clermont 1975; Perret-Clermont 1980; Perret-Clermont & Schubauer-Leoni 1981), in dealing with analogous experimental situations, claim that they observe more general processes: not mere imitation and transmission of behaviour models, but the social construction or reconstruction of meaning.

In experiments using a three-step paradigm (i.e. a collective situation with an individual pre- and post-test) it has been repeatedly observed that situations where individuals must co-ordinate their actions with one another lead them to produce new cognitive co-ordinations of higher competence.

Subsequent individual performances demonstrate that these collectively attained competences are consequently interiorized by the actors.

Analogous results have been attained using different tasks: a judgment of conservation of quantity, spatial representation, inter-dependent motor activity, replication of geometric designs (Doise & Mugny 1981a; Perret-Clermont 1980) and mathematical formulations (Schubauer-Leoni & Perret-Clermont 1980). Other authors present similar results regarding these same operator skills (Mackie 1980; Rijsman *et al.* 1980) or in regard to other mental operations, such as the evolution of the representation of distance (Frésard 1980), the structure of moral argumentation in adolescents (Bourquin 1981), the 'Hanoi Tower' game (Glachan & Light 1981) and exercises of cross-classification (Valiant, Glachan & Emier 1982).

Most of these experiments report some generalization of learning: the subjects exhibit newly acquired behaviours on tasks other than the specific learning one, and in some cases they produce arguments which can be considered as evidence of a deep understanding, going beyond simple memorization or habit.

In one of the experiments cited above (Perret-Clermont & Schubauer-Leoni 1981), we tried to consider not only the generalization of learning to other tasks but also to other *social settings* or experimental scenarios. Two types of social interaction between children of socially disadvantaged backgrounds were examined. In one experimental condition, the non-conserving child was instructed to divide the juice equally between himself and a conserving peer. In the other condition, the non-conserving child was confronted by a conserving adult model whose behaviour was matched to the conserving child in the first condition except that he was presented as a model. These confrontations resulted in learning for both groups of subjects. However, the children performed on a more advanced cognitive level on the pre-test if they were in a situation of sharing with an adult, rather than in an analogous one using dolls. On the post-test, these differences disappeared for those subjects in the experimental peer condition but not for those of the modelling condition. Thus it seems that the learning situation invoked by peer confrontation is more liable than a modelling situation to produce behaviours which can be generalized to different socially marked situations. Is this difference between peer interaction and modelling a general one, i.e., is the explanation to be found in the nature of the subject's social relations with the model or the peer? This is, in any event, what was observed for this operator activity, at this specific developmental level, in these circumstances with subjects from socially disadvantaged backgrounds.

Situations which are identical in the eyes of the experimenter can, in fact,



have different consequences for participants. These consequences can be, at least partially, predicted by variables such as age, previous operator level, socio-professional category of parents, sex (Doise & Mugny 1981a; Perret-Clermont 1980), place of habitation (Frésard 1980). But the causes of the influence of such variables remain to be explained. It should be noted that 'previous experience' of the subject refers not only to what he has experienced and elaborated outside the experimental situation but also to the experience accumulated during the experiment itself.

As reported above, it makes a difference whether the subject is confronted by an adult model to imitate rather than by a peer with whom he must actively seek an agreement. We have also observed that the latter experience permits children from socially disadvantaged backgrounds to bridge the gap between their operator performances and those of peers from advantaged backgrounds. The social experience offered by the experiment leads them to perform as well as the others. Heber (1977, 1981), in her studies of conversational interactions, has suggested that 'perhaps talking to another person produces interactions influences which have less to do with semantics and grammar of the utterances than with learning to appreciate a problem from the standpoint of another' (1981: 185). She likewise finds that adequate learning conditions can eradicate observed differences between children of differing social backgrounds.

The antecedent experience of the subject, as well as that accumulated during experimental social interactions, are thus likely to play a major role in the subject's elaboration of his cognitive behaviour. These experiences could be said to shape the manner in which the subject interprets the situation, evaluates the social relations in which he is involved, and engages himself in abstract cognitive activity. In several studies we have therefore varied the experimental conditions with regard to the social regulation of the relations between partners in order to observe their specific learning consequences.

Perret-Clermont (1980) found it necessary to constitute groups of subjects which were homogeneous with regard to school grade, so that children would consider themselves equals and therefore would not escape from conversing with their partners by using 'excuses' such as '...he's too young, he cannot understand!' Finn (1975), cited by Doise *et al.* (1981), who replicated and confirmed Finn's results, obtained superior operator performances when subjects had to share lemonade after invoking the right to equal recompense for equal work. Doise & Mugny (1981b) have conducted several experiments in which they explore further the influence of group work on learning.

But here again it is not possible to define 'objectively' the social character-

istics of situations. They are always marked by the subjectivity of the individual who perceives and interprets them. Another field of investigation, therefore, would be to identify under which conditions, cognitive, social, material and historical, characteristics of a situation are perceived as demanding a resolution. Pertaining to our study, we can ask ourselves in which circumstances and by what procedures can an individual be led to believe that a conflict has just such a 'rational' solution.

Lévy (1981) has studied the effect of adult questioning on the reasoning of the child. She has shown that the simple questioning of the subject's responses, even if it does not confer any explanatory or correct information, can trigger a re-structuration of his thinking in the direction of greater precision. However, this questioning loses its effect if, for social reasons, the adult seems aberrant to the child. It would be interesting to extend this experiment, using other conflicting tasks with a number of possible outcomes other than 'rational' elaboration. We know that all social interactions do not necessarily produce more rationality. Yet it would be illuminating to be able to specify in what circumstances so-called 'logical' reasoning is elaborated. This could be done by varying different types of tasks and scenarios as well as the relational and sociological positions of partners.

These experimental studies on operational thinking, although admittedly limited to occidental children in school situations, can clarify certain aspects of the dynamic of cognitive activity, at least in a Western cultural environment. It seems evident now that it is not sufficient to separate the cognitive and social origins of these behaviours. They are interdependent, and we have attempted to illustrate that an interactionist and constructivist approach can be appropriate to the understanding of the observed facts.

If we now consider the field of education, we can ask what can be ascertained from the processes that we have observed and described above, regarding the chances of realizing *didactic intentions* in this same socio-cultural context?

### 3. Mathematics in didactic situations<sup>6</sup>

3.1 Mathematics and operator notions. In the preceding part of this chapter, we tried to show how, in every test or learning situation, the subject's responses depend upon his interpretation of others' expectations of him. It is identical for pedagogical situations, where learning can only occur if the pupil has understood what he is supposed to do or know. The pupil's attempts

<sup>6</sup> The research on didactic situations which is presented here was supported by project no. 1.706.078 from the Fonds National Suisse pour la Recherche Scientifique.

to understand the questions posed by the experimenter or teacher are often undertaken in an active and conscious manner: one can observe him trying out his responses, modifying and validating them. But sometimes the interpretation of a situation imposes itself initially without a conscious effort on the part of the subject. This would imply a simple transfer, using salient analogies between the new situation and others that the subject has previously experienced. This generalization of behaviours can be facilitating at times and at others the source of error. It is always the subject's representation of the learning situation constructed in the framework of the 'intersubjectivity' established between participants which is the base upon which the dialogue and performances are elaborated (Rommetveit 1976, 1978).

The question which therefore interests us, and seems to be particularly appropriate for opening up a wide field of specifically pedagogical inquiry, is the following: how could one explicitly create 'didactic' situations (Brun 1981), constructed in such a way that when the child seeks to understand and to respond to what is expected of him he will already be led by this very activity to elaborate cognitions we want him to acquire?

We have seen that the subject's capacity to actualize a competence is not independent of the social and cultural situation in which he must perform. Although these competences assuredly have a certain generality, it would be unrealistic to consider them as abstractions independent of the contexts in which they function. For example, examining the existence of *décalage* (pertaining to the notional content, the task, the relational context, the circumstances, etc.) illustrates the limits of such an abstraction.

Most of the studies that we have reported up to this point have been concerned with *operatorial notions* in a Piagetian sense. If we now turn to more complex and more culturally marked notions, such as those found in primary school mathematics, we would expect to find that mathematical learning is also (and perhaps even more) dependent upon the situations and circumstances in which it is engendered.

On a paper-and-pencil test presented in class, most of the 7-year-old pupils tested showed a mastery of mathematical skill previously taught, i.e. the solving (filling) of lacunary equations (for example:  $5 + \dots = 8$ ). They seemed accustomed to this kind of task. However, when asked outside the class to write similar additive problems in another context (using bouquets of flowers, or trays of sweets) almost all the children failed to demonstrate any transfer of this previously acquired knowledge (Schubauer-Leoni & Perret-Clermont 1980).

In order to construct social situations where pupils are led to develop

mathematical competences generalizable to other important contexts, it is thus necessary to understand the dynamic of thought, and its cognitive and social complexity, in the particularity of tasks, relationships and circumstances. The simple apprehension of the subject's operatorial structures is not sufficient for the inference of his mathematical competences. It is necessary to distinguish the teacher's, or mathematician's, interpretation of the task from the interpretation developed by the learner through his attempts to respond.

We have examined these points in more detail elsewhere (Perret-Clermont *et al.* 1981, 1982). Mathematical knowledge and the operatorial structure of logical thinking are not directly interdependent as the existence of '*décalage*' suggests (Brun 1975; Brun & Conne 1979; Schubauer-Leoni & Perret-Clermont 1980; Vergnaud 1981). An adequate curriculum cannot be 'inferred' from stages of cognitive development. Neither mathematical operations, nor the writing of mathematical operations, should be confused with operatorial notions: they are distinct skills and competences. They cannot easily be hierarchized on the same developmental scale (Brun & Schubauer-Leoni 1981).

**3.2. Didactic situations.** A didactic situation can be characterized as an encounter in a particular school setting between a learner and a teacher who carries a message or intention concerning the learner. This modality of social interaction, with its cognitive, social and material characteristics, is in turn inscribed in a larger institutional context – i.e. the school – by which society constructs, reproduces and transforms itself.

However, the activity which the subject displays in the learning situation is not necessarily a direct reflection of the properties of this situation. It is therefore interesting to describe the progressive evolution of the strategies and procedures adopted by the subject within the constraints of the task. The teacher can vary these constraints and attempt to relate them to the representations of the situation actively formulated by the subject. In doing so, he also has the means to observe repercussions of his own interventions and of the task's constraints. The teacher is always engaging in social interaction with the pupil. Under which circumstances is this interaction the source of progress for the child? The causality is never direct. It depends on the child's previous learning and experience, his interpretation of the situation and its demands, his abilities to draw correct analogies between previously acquired mathematical knowledge and the requirements of the present task, and his awareness of the success or failure of the problem-solving strategies and generalizations that he develops. But all these activities are themselves likely to be markedly affected by social circumstances in ways that remain to be studied.

On this subject see, for example, Brousseau (1978a, b) who examines how circumstances create opportunities for the subject to reconstruct pre-existing knowledge or to transform his understanding of a notion. Balacheff (1981) has observed how peer group interactions between secondary school pupils on mathematical problems, affect their production of proofs. It might be noted that a mathematical procedure is not always immediately adopted by the child and is likely to appear only much later in his responses. It seems as though the meaning of this procedure is only slowly reconstructed by the pupil via a multiplicity of experiences. The question remains as to the circumstances in which pupils perceive a problem as belonging to the field of mathematics, and hence as deserving a 'mathematical solution', rather than as being, for instance, a social issue (Cavicchi-Broquet & Florimond 1981).

The didactic situations presented to pupils are culturally marked and will be understood by them as a function of their previous school and social experience. Mathematics has particularly powerful social connotations, especially in the school context: it holds an important place in education today, as indicated by the amount and duration of instruction given. Moreover, it often plays a primary role in the processes of school selection.

#### 4. Conclusion

We have tried to show, firstly that social interactions and their cultural contexts play an essential role in the elaboration of thinking and, secondly, that the subject himself is actively implicated in the acquisition of his instruments of comprehension. The child's activity is essential to his cognitive development; however, this activity is in constant interplay with the activity of others. The individual is, as it were, the 'co-author' of the development of his intelligence. His partners are the persons, adults or children, with whom he interacts. He also inherits pre-constructed systems of meaning (symbolic systems, structured by social norms, elements of established or informal knowledge, etc.) which he must appropriate, i.e. reconstruct, in order to be able to use them.

From the studies examined here, it is evident that the learner cannot be considered as a simple receiver of the knowledge that one seeks to transmit to him. He appears to be actively engaged in an activity which is neither a total creation nor a simple assimilation, but rather an appropriation of knowledge, in a dynamic which can be described in terms of construction and interaction. This knowledge is either the result of a cultural production historically antecedent to the psychological development of the individual in question, or the *hic et nunc* fruit of a continuous collective elaboration in which he takes part.

We think it important to go beyond the simple observation of signs of a competence, e.g. operator competence, to re-situate them in the context of their elaboration in order to determine their dynamic.

When these signs are considered *in abstracto*, i.e. abstracted from the situational conditions in which they appear, they can only be interpreted as fundamental characteristics of the individual. In fact they are the fruit of a social, psychological and cultural dynamic. The individual manifestation of competences (operator levels, strategies of problem resolution, reasoning) can be understood as active *responses* of an individual who, with others, interprets the demands of the situation and attributes meaning to his behaviour (not always consciously, of course) as a function of his personal history and the specific circumstances in which he finds himself. It is certain that the individual is not always actively involved in generating meaning. However, we have limited our present investigation to what could be called the 'creative side' of thinking. The 'orthodox side' remains to be explored. This could be done using the theory elaborated by Deaconch (1980) on the social regulation of thinking (see also Chapter 21).

Since our preoccupation is with the relevance of these studies for pedagogical practice, we do not seek a 'total' explanation. Reality is always more complex than experimental schemas. We see our experiments rather as a means of analysing our own representations of learning processes in order to test them, that is, to elaborate, validate or refute them according to the particularity of the context studied. In some ways, our research process is analogous to the processes we have observed during subjects' activity of learning.

#### References

- Balacheff, N. 1981. Étude de l'élaboration d'explications par des élèves de Troisième à propos d'un problème combinatoire. Report on research to Laboratoire d'Informatique et de Mathématiques Appliquées, University of Grenoble. April.
- Bandura, A. 1971. *Social learning theory*. New York: General Learning Press.
- Beartson, D. J. 1981. New directions in studies of social interaction and cognitive growth. In F. Serrafina (ed.) *Social cognition, context and social behavior: a developmental perspective*. New York: Guilford Press.
- Bourquin, J. F. 1981. Le rôle de la télévision dans le processus de la socialisation. Unpublished doctoral thesis. Ecole des Hautes Études en Sciences Sociales, Paris.
- Brousseau, G. 1978a. L'observation des activités didactiques. *Enseignement élémentaire des mathématiques*. IREM de Bordeaux, 18, 22-43.
- 1978b. Les obstacles épistémologiques et les problèmes mathématiques. *Cahier de l'IREM de Bordeaux*, 18.
- Brun, J. 1975. Éducation mathématique et développement intellectuel. Unpublished doctoral thesis. University of Lyon II.
- 1981. A propos de la didactique des mathématiques. *Math-école*, 100/101.
- Brun, J. & Conne, F. 1979. Approches en psychopédagogie des mathématiques. *Cahiers de la Section des Sciences de l'Éducation, Université de Genève*, 12.



- Brun, J. & Schubauer-Leoni, M.-L. 1981. Recherches sur l'activité de codage d'opérations additives en situations d'interaction sociale et de communication. IMAG, University of Grenoble, March.
- Bruner, J. S., Olver, R. R., Greenfield, P. M., et al. 1966. *Studies in cognitive growth*. New York: Wiley.
- Cavicchi-Broquet, I. & Flotmond, M. 1981. Étude empirique du rôle des représentations sociale qu'évoque un problème sur le raisonnement logico-mathématique d'adolescents. In A.-N. Perret-Clermont (ed.) *Objectivité et subjectivité dans les processus pédagogiques. Cahiers de la section des sciences de l'éducation, Université de Genève*, 22, 93-113.
- Coll Salvador, C., Coll Ventura, C. & Miras Mestres, M. 1974. Genesis de la clasificación y medio socio económico. Genesis de la seriation y medios socio económicos. *Anuario de Psicología*. Department of Psychology, University of Barcelona, 10, 53-99.
- Comiti, C., Bessot, A., Pariselle, C. et al. 1980. Appropriation de la notion de nombre naturel. IMAG, University of Grenoble.
- Cook-Gumperz, J. & Gumperz, J. 1982. Communicative competence in educational perspective. In L. C. Wilkinson (ed.) *Communication in the classroom*. New York: Academic Press.
- Dasen, P. & Heron, A. 1981. Cross-cultural tests of Piaget's theory. In C. Triandis & A. Heron (eds.) *Handbook of cross-cultural psychology*, vol. 4. Boston: Allyn and Bacon.
- Deconchy, J. P. 1980. (*Religious*) *orthodoxy, rationality and scientific knowledge*. The Hague: Mouton.
- Doise, W. 1973. La structuration cognitive des décisions intellectuelles et collectives d'adultes et d'enfants. *Revue de Psychologie et des Sciences de l'éducation*, 8, 133-48.
- Doise, W. & Mugny, G. 1981a. *Le développement social de l'intelligence*. Paris: Intéreditions.
- 1981b. Le marquage social dans le développement cognitif. Paper presented to the conference 'Représentations sociales et champ éducatif', Laboratoire Européen de Psychologie Sociale, Aix-en-Provence, November-December.
- Doise, W., Mugny, G. & Perret-Clermont, A.-N. 1975. Social interaction and the development of cognitive operations. *European Journal of Social Psychology*, 5, 367-83.
- Doise, W., Rijsman, J. B., Van Meel, J., Bressers, I. & Pinxten, L. 1981. Sociale marketing en cognitive ontwikkeling. *Pedagogisch Studien*, 58, 241-8.
- Donaldson, M. 1978. *Children's minds*. Glasgow: Fontana/Collins.
- Ervin-Tripp, S. 1982. Structures of control. In L. C. Wilkinson (ed.) *Communication in the classroom*.
- Finn, G. 1975. The child's conservation of liquid quantity and its embedding in the social world. Unpublished MS. Department of Psychology, Jordanhill College of Education, Glasgow.
- Frèsard, M. D. 1980. La représentation de l'éloignement dans des dessins individuels et collectifs d'enfants de neuf à douze ans. Unpublished doctoral thesis, University of Geneva.
- Glachan, M. & Light, P. 1981. Peer interaction and learning: can two wrongs make a right? In G. E. Butterworth & P. Light (eds.), *Social cognition: studies in the development of understanding*. Hassocks: Harvester Press.
- Goffman, E. 1959/76. *The presentation of self in everyday life*. New York: Doubleday Anchor. 1959: Harmondsworth: Penguin. 1976 edn.

- Harroche, C. & Pêcheux, M. 1972. Facteurs socio-économiques et résolution de problèmes. *Bulletin du CERP*, 21, 101-11.
- Heber, M. 1977. The influence of language training on seriation of 5-6-year-old children initially at different levels of descriptive competence. *British Journal of Psychology*, 68, 85-95.
1981. Instruction versus conversation as opportunities for learning. In W. P. Robinson (ed.) *Communication in development*. London: Academic Press.
- Katz, I. 1970. Experiments on Negro performance in bi-racial situations. In M. W. Miles & W. W. Charters (eds.) *Learning in social settings*. Boston: Allyn and Bacon.
1973. Negro performance in interracial situations. In P. Watson (ed.) *Psychology and race*. Harmondsworth: Penguin.
- Labov, W. 1972. The study of language in its social context. In P. P. Giglioli (ed.) *Language and social context*. Harmondsworth: Penguin.
- Latour, B. & Woolgar, S. 1979. *Laboratory life: the social construction of scientific facts*. London: Sage.
- Lévy, M. 1981. La nécessité sociale de dépasser une situation conflictuelle générée par la présentation d'un modèle de solution de problème et par le questionnement d'un agent social. Unpublished doctoral thesis, University of Geneva.
- Light, P. H., Buckingham, N. & Robbins, A. H. 1979. The conversation task as an interactional setting. *British Journal of Educational Psychology*, 49, 304-10.
- Mackie, D. 1980. A cross-cultural study of intra-individual and inter-individual conflicts of centration. *European Journal of Social Psychology*, 10, 313-18.
- McGarigle, J. & Donaldson, M. 1974. Conservation accidents. *Cognition*, 3, 341-50.
- Moscovici, S. & Paicheler, G. 1973. Travail, individu et groupe. In S. Moscovici (ed.) *Introduction à la psychologie sociale*, Vol. II. Paris: Larousse.
- Mugny, G. & Doise, W. 1979. Factores sociológicos y psicocológicos en el desarrollo cognitivo: una nueva ilustración experimental. *Anuario de Psicología*, 21, 5-25.
- Mugny, G., Doise, W. & Perret-Clermont, A.-N. 1975-6. Conflit de centrations et progrès cognitif. *Bulletin de Psychologie*, 29, 199-204.
- Mugny, G., Lévy, M. & Doise, W. 1978. Conflit socio-cognitif et développement cognitif. *Revue suisse de psychologie pure et appliquée*, 37, 22-43.
- Perret-Clermont, A.-N. 1980. *Social interaction and cognitive development in children*. London: Academic Press.
- Perret-Clermont, A.-N. & Schubauer-Leoni, M.-L. 1981. Conflict and cooperation as opportunities for learning. In W. P. Robinson (ed.) *Communication in development*. Perret-Clermont, A.-N., Brun, J., Conne, F. & Schubauer-Leoni, M.-L. 1981. Décontextualisation et recontextualisation du savoir dans l'enseignement des mathématiques à des jeunes élèves. Paper presented to the Colloque du Laboratoire Européen de Psychologie Sociale 'Représentations sociales et champ éducatif', Aix-en-Provence, November-December.
- Perret-Clermont, A.-N., Brun, J., Saada, E. H. & Schubauer-Leoni, M.-L. 1982. Processus psychosociologiques, niveau opératoire et appropriations de connaissances. *Interactions Didactiques*, 2, University of Geneva and University of Neuchâtel.
- Rijsman, J.-B., Zoetebier, J.-H. Th., Gintner, A. Jf. & Doise, W. 1980. Sociocognitif conflict en cognitive ontwikkeling. *Pedagogische Studien*, 57, 125-33.
- Rommetveit, R. 1976. On the architecture of intersubjectivity. In L. Strickland et al. (eds.) *Social psychology in transition*. New York: Plenum Press.

1978. On piagetian cognitive operations, semantic competence, and message structure in adult-child communication. In I. Markowa (ed.) *The social context of language*. London: Wiley.
- Rose, S. A. & Blank, M. 1974. The potency of context in children's cognition: an illustration from conservation. *Child Development*, 45, 499-502.
- Rosenthal, T. & Zimmerman, B. 1978. *Social learning and cognition*. New York: Academic Press.
- Russell, J. 1981a. Dyadic interaction in a logical reasoning problem requiring inclusion ability. *Child Development*, 52.
- 1981b. Why socio-cognitive conflict may be impossible: the status of egocentric errors in the dyadic performance of a special task. *Educational Psychology*, 1, 2.
- Schaffer, H. R. 1979. Acquiring the concept of the dialogue. In M. Bornstein & W. Kessen (eds.) *Psychological growth from infancy*. New York: Erlbaum.
- Schubauer-Leoni, M.-L. & Perret-Clermont, A.-N. 1980. Interactions sociales et représentations symboliques dans le cadre de problèmes additifs. *Recherches en didactique des mathématiques*, 1, (3), 297-343.
- Smedslund, J. 1966. Les origines sociales de la décentration. In F. Bresson & M. de Montmollin (eds.) *Psychologie et épistémologie génétique. Thèmes Piagétiens*. Paris: Dunod.
- Valiant, G., Glachan, N. & Emley, N. 1982. The stimulation of cognitive development through cooperative task performance. *British Journal of Educational Psychology*, 52, 281-8.
- Vergnaud, G. 1981. *L'enfant, la mathématique et la réalité*. Collection Exploration, Berne: P. Lang.

## 5. The development of thinking about socio-economic systems

GUSTAV JAHODA

Mais, quand il s'agit de faire la dame âgée et respectable, préposée à la caisse, je me trouvais soudain embarrassé. En cette conjecture, je sortis du magasin et allai demander à ma chère maman un éclaircissement sur le point qui restait obscur pour moi. J'avais bien vu la dame âgée ouvrir son tiroir et remuer des pièces d'or et d'argent; mais je ne me faisais pas une idée suffisamment exacte des opérations qu'elle effectuait. Agenouillé aux pieds de ma chère maman qui, dans sa bergère brodaît un mouchoir, je lui demandai: - Maman, dans les magasins, est-ce celui qui vend ou celui qui achète, qui donne de l'argent? (Anaïde France, *Le petit Pierre*)

What has come to be known as 'social cognition' is a broad and somewhat ill-defined field which may be regarded as having originated in its modern form with the publication in 1932 of Piaget's book on *The moral judgement of the child*. What was new about Piaget's approach was not the topic, on which there have been numerous descriptive studies before and since, but his attempt to establish certain principles underlying the development of children's ideas about moral behaviour. In the most direct line of descent from this tradition is the work of Kohlberg (e.g. 1976), which has recently been subjected to a penetrating critical scrutiny on this side of the Atlantic (Eckensberger & Silbereisen 1980). Generally, the problem of moral development is probably the most intensively researched aspect of social cognition, and has also been studied cross-culturally (Edwards 1981).

A somewhat different aspect of social cognition that has become an important focus of interest during the 1970s and 1980s concerns the growth of children's understanding of personal relationships, the rules governing these, and the acquisition of active skills, such as role-taking, that require insight into the needs of 'the other' (Damon 1977, 1978; Flavell & Ross 1981; Click & Clarke-Stewart 1978; Youniss 1980). Since children interact from birth onwards with other people of varying ages, the development of moral ideas, of social conventions and such-like may be regarded as being closely tied to, and largely arising from, first-hand experience (see Chapter 2).

The situation is not the same as far as the development of concepts relating