

SOCIAL-CONSTRUCTION OF LOGICAL STRUCTURES OR SOCIAL CONSTRUCTION OF MEANING ?

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## Résumé

Que ce soit en Europe de l'Ouest ou dans les pays anglo-saxons, Piaget et les néo-piagétien demeurent les chefs de file en psychologie génétique de l'étude du développement cognitif de l'individu. Leurs théories insistent surtout sur l'importance des structures logico-mathématiques qui interviennent pour une grande part au cours de ce développement. Au point d'éclipser d'autres courants de pensée qui mettent davantage l'accent sur le rôle accordé aux expériences sociales dans le développement cognitif (Mead, Vygotsky), mais sans que ces auteurs aient eu réellement recours à la vérification expérimentale.

Le but de l'article de Light et Perret-Clermont est précisément de remettre en question la trop grande place accordée aux structures logiques pour expliquer le développement cognitif (d'où l'occultation des facteurs sociaux susceptibles d'affecter les structures cognitives). Light et Perret-Clermont veulent ainsi montrer que le développement psychologique de l'enfant se caractérise par une capacité à interagir socialement. En effet les échanges avec autrui doivent permettre à l'enfant d'attribuer progressivement une signification mais aussi un sens aux situations d'interaction. L'enfant pourra alors transférer de façon plus ou moins adéquate ce gain d'expérience (à la fois social et logique) à d'autres situations dans lesquelles il sera confronté à lui-même ou à d'autres partenaires.

Light et Perret-Clermont se proposent de montrer par exemple que l'intrication des processus cognitifs, sociaux et discursifs se manifeste autant dans des situations spécifiques de test que dans des situa-

tions d'apprentissage plus générales. Et par conséquent d'examiner la possibilité selon laquelle les mécanismes sociaux peuvent exercer une influence prépondérante dans la définition et le déroulement de ces deux types de situations.

Alain Brossard

For the last quarter century at least, in Western Europe and in the English-speaking world, the study of "cognitive development" has been dominated by Piaget. The term cognitive-developmental is, indeed, synonymous with Piagetian or neo-Piagetian approaches. The earlier theoretical positions of Mead, for example, or Vygotsky, which attempted to ground an account of development in the child's social experiences, were almost totally eclipsed by the Piagetian essentially individualistic account of cognitive development. Piaget, as a theoretician, had in fact recognized the importance of social interactions for cognitive development but neither he, nor his close followers paid much attention to these factors in their empirical work on cognitive development. The neglect shown in these studies both of the role of the social context of the testing situation and of the role of interpersonal interactions and relationships in learning situations has important consequences for the understanding of the child's development that can be gained from them. We will argue in this paper that such an approach is likely to overestimate the logical characteristics of thinking behaviours and to mistakenly presuppose that the mind has a uniquely logical structure. Such an approach remains blind to social processes and to the way in which the social relationships in which the child is embedded affect his cognitive behaviours. We will argue that a growing child is characterized by his social sensitivity and that he is actively engaged in social interactions of which he tries to make sense and from which he gains experience (both social and logical) that he will then more or less adequately transfer to other social or non-social situations. We will try to show that this interdigitation of cognitive, social and discourse processes is present in testing situations as well as in learning situations. In fact a testing situation already requires that the child learns what is required from him in this specific setting, while in most

learning situations the learner has to understand what is to be learnt, to learn it, and to demonstrate (as in testing situations) that he has mastered it. The prime objective of the present paper is to examine the possibility that social processes common to both testing and learning situations have a major part to play in determining the outcome of those situations.

## 1. Peer interaction and cognitive development

Even with the more recent rise of 'social cognition' as a research topic, the dependence of social upon cognitive-development has been stressed much more than its converse. However, we have seen in the last ten years a steady increase in research interest in the role of social interactions in cognitive development. One strand of this research is concerned with the role of more or less symmetrical child-child interaction. The role of such peer interactions in cognitive development has been examined from a variety of standpoints, and we shall very briefly review some of these at the outset. Our focus will be on conservation, since conservation concepts play a key role in the Piagetian cognitive development scheme, and conservation has been perhaps the most widely used index of peer facilitation.

One of the sources of research interest in child-child interaction and learning was the concern with modelling which marked much American developmental research of the early and mid 1970's. From the standpoint of social learning theory, studies were conducted in which children watched other children performing various cognitive tasks before having their own performance assessed on similar tasks. The choice of the conservation task for many of these studies was essentially polemical, and indeed they did succeed in showing that initially non-concerning children could be induced to give conserving judgements

after having simply watched another child model such judgements. However, there was less evidence that these acquired judgements would generalise or endure, or that the children could explain or justify them. Thus important questions remained unresolved. If increased logical power, or ability to structure and justify responses was taken as the criterion of the cognitive development of the child, then the success of the social modelling studies in promoting cognitive development is questionable. Even if this criterion were to be met the question would remain: how can the imitation of a model affect the understanding that the child develops of a notion or of a task? The mediating processes still have to be described if we are to get beyond either a simplistic empiricism or an equally simplistic psychological preformationism.

Other American researchers began to experiment with the effects of more active interaction between pre-operational and operational children, and these studies provided rather firm evidence of real cognitive gains for the initially pre-operational subjects.

However, such gains may not actually depend at all upon having a partner who presents an operational solution. Rather, they may depend simply on having a partner who offers and defends a different solution. Interest began to focus on the possible role of contradiction or cognitive dissonance, and more generally on the possibility that two differing but equally inferior judgements could form the basis for productive interaction.

This possibility echoes some of Piaget's early writings, which suggests a privileged role for peer interaction in the 'decentering' of the child's thought (see also Smedslund, 1966). The Piagetian emphasis was of course on the child's active resolution of conflicting pre-operational centrations, rather than on passive

modelling processes. Only in the last twelve years, however, has this approach been developed experimentally. Doise, Mugny and Perret-Clermont have shown with a variety of tasks that the performance of children in pairs or groups may often be superior to that of children working alone and that this superiority carries over into individual performance on subsequent post-tests. Moreover, this superiority is not simply a matter of less able children imitating more able partners, nor of simple compliance to a request, rather it involves an original restructuring of the behaviour in more logical terms (as evidenced by the explanations given).

These findings were interpreted in terms of "socio-cognitive conflict". In the group situation, the child finds himself confronted with alternative and conflicting solutions which, while not necessarily offering the correct response, highlight some of the cognitive factors which he has to take into account in order to pursue the social interaction in which he is involved with his partner. Hence at the collective level the individuals need to co-ordinate their different and sometimes conflicting points of view and this leads them into a restructuring of their thinking and understanding. Cognitive conflicts created by social interaction appear then as the locus at which the power driving intellectual development is generated.

These studies (and others, for a review see e.g., Perret-Clermont et al. 1984) were relatively successful in dealing with the Piagetian logical "criterion problem". Perret-Clermont for example has been able to show that children benefitting from peer interaction experiences on conservation tasks are frequently able to produce novel logical justifications. But demonstrating that any 'acquired' conservation is genuine is only part of the problem: what is coming increasingly into question is the children's initial status as non-conservers. In



the classical Piagetian perspective it is taken for granted that failure on the standard Piagetian tests of conservation is indicative of an absence of the relevant logical competences. However, it is by no means self-evident that this is always so and to the extent that other processes are involved, they may have an important part to play in explaining the efficacy of the peer interaction studies, in which the expected logical behaviours finally get displayed by the subjects sometimes directly during the test and sometimes only on a post-test subsequent to a peer-interaction session. Recently a distinctive strand of research focussing on the social context of cognitive testing has begun to cast a new light on the reasons for failure on standard conservation tests.

## 2. The social context as a factor affecting cognitive performance

A landmark in the study of the social context of testing was McGarrigle and Donaldson's 'Conservation Accidents' paper (1975), which reported that relatively high rates of successful conservation judgements could be elicited from four and five year olds when the transformation of materials in the conservation tasks was achieved not by the experimenter but by a mischievous teddy bear. Light, Buckingham and Robbins (1979) used a badly chipped beaker as a reason for pouring the contents from one container into another, and thereby obtained 70 % correct conservation judgements from five and six year olds, only 5 % of whom gave correct judgements under the standard conditions of testing. Miller (1982) has replicated this 'chipped beaker' study, as have Bovet, Parrat-Dayana and Deshusses-Addor (1981), though in this case without a standard comparison condition. In both studies the level of conserving judgements obtained from five year olds in the 'incidental transformation' condition was around 80 %.

A variety of other similar techniques have been used. For example, in a number conservation task, Miller (1982) got the child at the end of a session to help him spread out two rows of counters equally. He then 'remembered' that only one of the rows was supposed to be spread out for the next child, and so changed it. In this case over 90 % of the five year olds asserted that the two rows still contained the same number of counters. Rates of conserving judgements approaching 90 % have also been obtained from five year olds by Hargreaves, Molloy and Pratt (1982). In their procedure initial equality was established in a number conservation task. Then a second adult, ostensibly testing other children in the next room, came in to 'borrow' some of the counters, taking them from the table.

The experimenter protested that the counters were needed, and they were returned to the table, but naturally in the course of this they became disarranged. When the post-transformation questions were asked, here again children who failed on the standard version of the same conservation test offered what appeared to be conserving judgements.

There is plenty of room for argument about the status of the correct conservation judgements obtained in studies such as these. McGarrigle and Donaldson saw them as evidence of genuine precocious logical ability, while Bovet and others have argued that the distraction of the child's attention from the transformation plays a major role. It is widely agreed that failures in the standard condition may arise from the misleading message implicit in the experimenter's deliberate transformation of the materials ("take note of this transformation, it is relevant"). But by the same token, one could argue that successes in the modified incidental and accidental transformation conditions may arise from the converse and

equally implicit message ("this transformation makes no difference, ignore it"). Thus the same kind of social interactional processes which militate against conserving judgements in the standard condition may militate in favour of them in the modified conditions. Indeed, once this Pandora's box is opened, it becomes hard to see how any testing situations could ever be neutral.

It is not only the way that the transformation of material is handled in the conservation task which turns out to be important. As far back as 1974, Rose and Blank published a study showing that leaving out the pre-transformation question has a significant facilitating effect, despite the fact that normally all children answer this question correctly. The pre- and post-transformation questions in a conservation test are worded in the same way, and it would seem that the repetition of the question by the experimenter may lead the child to suppose that his first answer was wrong. Alternatively, the repetition of the question after the transformation may lead the child to suppose that the transformation must, after all, be relevant to the question. This study has recently been replicated for several conservation tasks by Samuel and Bryant (1984).

In the context of an unpublished study (Perner, Leekam and Wimmer, 1984), Perner has suggested a further dimension to this issue. In the standard condition the post-transformation question cannot be treated by the child as a straightforward question (a request for information) since everything that he or she knows, the experimenter obviously knows too. Perhaps the young child's difficulty is in dealing with this type of 'examination question'. If so, the difficulty could be alleviated by introducing a second experimenter to ask the post-transformation question.

In a recently completed study developing this idea (Light, Gorsuch & Newman, in preparation), we tested five and six year old children in pairs on a conservation of discontinuous quantity task using dried peas in beakers of various sizes. For half of the children the task was introduced in a standard way, while for the other half it was introduced in the context of a competitive game which the children were going to play using straws to extract the peas from the beakers. The game made it obviously important that the quantities be equal since the game must be 'fair'. But for each condition half of the pairs were tested using an 'interruption' regime. Here, after the experimenter had established the initial equality of amounts (in heaps) and then transformed the materials (by putting them into two rather different beakers) a second adult came in and said there was a telephone call for the experimenter. The second adult took over from the experimenter and asked the critical post-transformation question. Here, of course, the question could be asked 'in good faith' (as a genuine request for information) since the questioner had not been witness to the initial equality. Both manipulations had significant effects: the introduction of the competitive game context substantially increased the frequency of correct conservation judgements compared to the standard condition, and the introduction of the second adult had a similar effect, even without the competitive game element.

These studies, taken together, amount to an impressive testament to the young child's sensitivity to the nuances of communicative intent. Admittedly, few of them have sought logical justifications as an index of the adequacy of the conservation judgements given, and the evidence from those which have has been somewhat mixed (Parrat-Dayana & Bovet, 1982; Neilson, Dockrell & McKechnie, 1983; Perner, Leekam & Wimmer, 1984). But

carryover of successes from modified to standard conditions of testing has been demonstrated in those few studies which have concerned themselves with this (e.g. Rose & Blank, 1974; McGarrigle & Donaldson, 1975). And certainly as far as children's conservation judgements themselves are concerned, it is now clear that relatively subtle inter-personal cues available in the testing situation frequently have a major effect upon the children's responses. This brings us to the question of the meaning of the testing situation for the participants. We will take up this point again after having considered how different social contexts of interaction similarly affect the learning process.

3. The social meaning of a context is constructed through the social interaction that takes place between the participants (adult and peers)

Are social contexts independent external variables that just affect individuals' behaviours, or are the characteristics of the social context genuine ingredients of the observed performance? The characteristics we have in mind include the inter-personal relationships involved - the adult as a model, the adult as a "good faith" partner, the adult as "knowing better" or the peer as "likely to be wrong"; a just or an unfair distribution between partners of equal or unequal (gained or established status, etc. and the structuring of the situation by the discourse initiated by the partner, whether the partner is an adult or a peer. In other words, is a logical response given by a subject most usefully understood as the individual's "private" response or as the emerging result of a social construction of shared meaning between the child and his partner(s)? To try to deal with this question we will consider the peer interaction studies as studies dealing

with the evolution of children's responses through three phases (pretest, social interaction, post-test).

Subjects who come to the laboratory for a test or a training session are not extracted from a social vacuum but come from various social networks in which they have developed and gained social experience. In our research date we have repeatedly found that subjects with different social origins perform differently at the pretest (with children of working class origin performing usually at a lower logical level than upper class children) but we have also found several times that children of these different social groups benefitted differently from the social interaction offered (the working class children benefitting most from peer interaction, and the children belonging to groups with higher social status already progressing during the pretest if the adult experimenter offered appropriate contradiction to their initially non-conserving point of view (Schubauer-Leoni & Perret-Clermont 1981, Perret-Clermont & Mugny, 1985). Of course social origin in itself is a poor predictor of cognitive performance, and this variable was found to interact with others (sex, rural vs urban origin, age, etc. e.g., Fresard 1980, Nicolet 1984) but still significant relations are often found between these social characteristics and levels of performance on Piagetian classical tests. Results of this type have also been found by sociolinguists showing significant correlations between social origin and linguistic performances measured according to classical criteria, as well as between type of interpersonal relationship and linguistic performance (e.g. Labov). Explanations are needed of the relevant processes. The linguistic performances, including those that reveal cognitive structures, are dependent on the social marking of the discourse process between the participants.

Perret-Clermont and Schubauer-Leoni (1981) studied the

effect of task presentation on children's responses in a three steps design. In one experimental condition, according to the traditional Genevese "scenario" the child had to share the juice of the conservation of liquids test equally between the experimenter and himself. In the other condition the child had to do the same action but dividing the juice for two identical dolls. On the pretest the results show a notable difference according to social groups: girls, and especially those of disadvantaged social origin, performed more poorly in the dolls condition. The subjects then underwent a peer interaction session. On the post-test the task presentation effect had disappeared. The observed differences in the pretest can be taken as indicating that even if a testing situation is rigorously standardized in the eyes of the experimenter it does not present the same difficulty for subjects of different past social experience, but appropriate social interaction can make this difference disappear.

The impact of the different modalities of relationship to the adult was examined by Levy (1981) using a spatial transformation task. In this experiment the subject had to reproduce the plan of a village with the experimenter. In one experimental condition, an aberrant image of the adult was induced beforehand by telling the subject that the adult experimenter with whom he was going to play made frequent errors. In other condition nothing was said of the adult's ability. In both conditions however the experimenter presented an incorrect construction to the child. Only in the second did the child progress. The induced negative image led the child to discredit the point of view with which he was confronted, even though it was offered by an adult, and as a consequence there was no socio-cognitive conflict to be resolved by logical reasoning.

Other characteristics of the interpersonal relationship established between the partners during the interaction are liable to render the diverging perceptions of the partners (and thus the socio-cognitive conflict) more or less salient. This is a possible explanation of the differences obtained due to allocation of differently shaped glasses to partners in an interaction, who then seemed to be more or less favoured in the quantity of juice offered. For example, Doise, Rijsman, Van Meel, Bressers, and Pinxten (1981) report a study with pairs of nonconserving children who were told that since they deserved equal rewards they should have equal amounts of juice. They were indeed given equal amounts, but in different shaped containers. After asking the children about the equality, the experimenter transferred the quantities into two identical beakers, and then back to their original containers, asking the children at each stage about the equality of amount. This condition generated a substantial number of correct conserving judgements which carried over to post-test. However, a similar condition without any of the emphasis on rewards or fairness was much less effective. So too was an individual condition without emphasis on rewards or fairness but an individual condition which did have this emphasis (in this case on equality of reward with another child 'who will come in a minute') proved to be just as effective as its two-child counter-part. Iannaccone and Nicolet, (1985) found such effect after a game that both children had won (hence deserving a fair and equal reward) and the effect was stronger for certain social groups (i.e. girls and rural children).

To understand results such as these one would have to take into account the meaning of reward, the understanding of the notion of "fairness" in juice distribution between partners of unequal social status and for example the effect of task repetition in a three



step design. Repetition could be understood by the child in various ways, for example as a means for the adult to give negative feedback on the child performance - another way to create a socio-cognitive conflict between the adult and the subject. All these results suggest that the child's attention will not necessarily be focussed on what seems to the adult to be the key feature of the task: its "logical" dimension. It will take some interaction (verbal cues from an adult or a child, explanation of a norm of equality, changes in the scenario, etc.) for the child to understand what kind of answer the adult is looking for. The observation of the gaze exchanges between experimenter and child reveal differences according to the cognitive development of the subject (Perret-Clermont & Brossard, 1985). And the path towards this understanding, this shared intersubjectivity, will be different for children with different past social experience, and different according to the social and cultural distance between the experimenter and the subject. Through case studies (Bell, in course) and role-playing (Grossen, in course), we are now studying the cues by which the adult or the peer makes his intentions known to his partner, as well as the signs of misinterpretation of these intentions by the subject. In a one step design (a typical testing situation) the subject is given one opportunity to understand what is expected from him. Using three step designs it seems that we have found that children who do not manage to respond adequately in a testing situation with an adult might gain the necessary experience from interactions with peer (s) under certain conditions.

#### 4. Social construction of logical structures or social construction of meaning?

We would suggest that in all these situations the analysis should now focus on the meaning of the situation for

the participant or participants. The presence of another child may in and of itself alter that 'meaning' in a variety of ways; for example the issue of fairness or unfairness which we have been discussing may almost inevitably creep into such situations in some degree. Or it may be that the explicit request for a consensus response from children who are differently situated vis a vis the materials leads the children to be more likely to regard the post-transformation question as bearing on what 'actually is' the case, rather than on appearances (cf. Russell, 1982). So in these and other ways, putting children together may lead them towards placing a somewhat different construction upon the questions which they are asked. But as we have seen, there are many other ways (from chipped beakers to well timed telephone calls) in which children can be led to place different constructions upon the questions that are asked.

Finally, are contextual factors simply affecting the expression of an understanding of conservation, this understanding being a logical competence? The studies reported previously tend to bring evidence that the understanding of conservation is not only a matter of logical competence but also the result of an interpersonal definition between the partners of what is to be considered (i.e. what is the conserved object) and of what this notion of conservation is useful for (for example, to overcome perceptual illusions or to guarantee the fairness of a reward distribution between socially equal partners).

From such a pragmatic, functional, perspective conservation appears more as an agreement on a usable 'rule of thumb' than as a matter of transcendent logic. Indeed isn't it the case that when juice is poured from one beaker to another there are always drops left in the first vessel? And some juice will also disappear through evaporation. But of course we are free to implicitly and

jointly decide not to care about these 'details'!  
Arguably the essence of abstract thinking lies at least  
as much in knowing what can and what cannot be treated as  
'details' as it does in the logical inferences involved.

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