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ABSTRACT

This paper is a first report from the project "Activity Learning and Cooperation," financed by the Swedish Board of Education. The aim of the project is to establish a theoretical basis for a field study of locally initiated experiments using various teaching strategies. More specifically, this paper is restricted to a discussion of the cognitive framework underlying the theoretical basis. A review of the psychological foundations of activity learning shows that theorists often postulate the efficiency of activity learning, or that the relation between recommendations for teaching strategies and psychological theory is often handled in a superficial way. An attempt is made to formulate characteristics of "Activity" with reference to Piaget's description of cognitive development. Activity is described as a mode of thinking about phenomena. This mode of thinking can be characterized by a willingness to try different ways of interpreting a phenomenon, a searching for intentions behind an act or a text, and a testing of knowledge already accessible in new situations. This is called the assimilative aspect of the acquisition of knowledge. "Activity" is also characterized by a willingness to change one's mind, and the efforts made to understand, which is called the accommodative aspect of the acquisition of knowledge. A note is also added about the field study, and about certain expected results. (Author/MP)

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ACTIVITY LEARNING AND LEARNING ACTIVITY

Discussions of a concept, and an outline for an empirical study

Report No. 2 in the project "Activity Learning and Cooperation"

Ola Halldén

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RESEARCH REPORT

from The Institute of Education,
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Report No. 2 in the project
"Activity Learning and Cooperation"

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ABSTRACT

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This paper is a first report from the project "Activity Learning and Cooperation", financed by the Swedish Board of Education. Its aim is to establish a theoretical basis for a field study of locally initiated experiments with teaching strategies, and as such the discussion is restricted to a cognitive framework. A review of the psychological foundations of activity learning shows that theorists often postulate the efficiency of activity learning, or that the relation between recommendations for teaching strategies and psychological theory is often handled in a superficial way. An attempt is made to formulate characteristics of "activity" with reference to Piaget's description of cognitive development. Activity is described as a mode of thinking about phenomena. This mode of thinking can be characterized by a willingness to try different ways of interpreting a phenomenon, a searching for intentions behind an act or a text, a consideration of the function of an act or a text, and a testing of knowledge already accessible in new situations. This is called the assimilative aspect of the acquisition of knowledge. "Activity" is also characterized by a willingness to change one's mind, and the efforts made to understand. This is called the accommodative aspect of the acquisition of knowledge. A note is also added about the field study, and about certain expected results.

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INTRODUCTION

The assignment and its purpose

In the autumn of 1977, a working group was formed within the Swedish Board of Education to study the "Internal Work of the Upper Secondary Comprehensive"(*Gymnasieskolans inre arbete*, GIA). Within this working group, a research project was initiated which came to be termed "Activity Learning and Cooperation". Planning started in the spring of 1978, with a view to full operation from Christmas of that year. The project is scheduled to continue until 1 July, 1981.

The discussions of the working group that constitute the starting-point of the project related to the questions of what such terms as "activity learning", "cooperation" and "student influence" *can* stand for, *should* stand for, and *stand for* in practical teaching situations. Another question that arose was how these work-forms can be related to the effort to achieve a closer association between the school, the community and working life. These discussions led to the drafting of a project plan. According to this plan, the aim of the project is "chart and analyse processes in experiments at the Upper Secondary Comprehensive with work-forms designed and intended to achieve:

(1) student participation in the planning of teaching
(2) cooperation between students in the teaching situation
(3) student activity in the teaching situation (e.g. in the form of practical experiments etc.)
(4) an acquisition of knowledge that is experienced by the student as relevant".

Design of the investigation

It was planned that the investigation should cover i) an interpretation and specification of the above-mentioned concepts "student participation", "cooperation", "student activity" or "activity learning", and "relevance", ii) an empirical study in the field. Below, these concepts will be discussed and an attempt at interpretation and specification made, which

will provide a basis for the empirical study. In discussing these concepts, I will take as my starting-point that of "activity learning", partly because I believe it to be the most interesting from the pedagogic standpoint, partly because it can provide a suitable ground for delimitation of the other concepts.

The report concludes with a brief presentation of how the empirical study is designed.

This report is a slightly revised and expanded version of Report No. 1 from the project (Halldén 1979).
A note on terminology is perhaps in place. The distinctions between 'activity learning', 'learning activity', and 'learner activity' are usually not made in Swedish. A common term in Swedish is "*elevaktivitet*", which can have any of the above mentioned meanings. In this report a plea is made for the study of the learner's strategy and actions when working with a learning task, rather than the study of work-forms. Consequently "elevaktivitet" is translated as activity learning in the beginning of the report and as learning or learner activity towards the end.

ON THE VALUE OF ACTIVITY LEARNING

Widespread agreement seems to prevail regarding the value of learner activity in the teaching situation. The Swedish Curriculum for the Upper Secondary Comprehensive observes that "Every effort shall be made to promote active participation by the student, and this activity on the part of the student shall be as independent and richly varied as possible" (p. 16). The reasons customarily quoted in favour of this activity on the part of the student vary in type. Some relate to the object or purpose of the teaching. Others emphasize the effect of such activity in creating motivation. Finally, it is possible to argue for activity learning from the standpoint of epistemology, or genetic epistemology: the acquisition of knowledge and the growth of knowledge in the individual presuppose an active mode of thinking in the individual.

Activity learning as an objective in teaching

According to the curriculum, the objectives laid down for teaching presuppose activity on the part of students. The school is designed to foster individuals with an active attitude towards their situation, which presupposes that it should also provide opportunity for such an attitude.

In the pedagogic literature, Illeris (1976) can perhaps be said to represent a corresponding view. One of the arguments he quotes for problem-oriented, participant-guided teaching is the demands he considers that society and working life make on the indivudual.

The question of what competence society demands of the individual is an important one, but also very difficult. It has been claimed that development is tending to produce demands for higher qualifications (e.g. Häyrynen and Hautamäki 1976), but the converse has also been claimed, namely that it is producing an impoverishment of labour (e.g. Altvater 1976). In the context of vocational training in teletechnology, Halldén and Lange (1978) point to opposite tendencies regarding the development of qualifications. There is reason to suppose that while industry has

an increasing need of unskilled labour, increasing technical qualifications will be required at other levels, both in the industrial companies and other sectors. The question is a complex one, and I do not intend to consider the problems in any further detail. It will suffice to note that my starting-point here is the general objectives as worded in the curriculum (Lgy 70).

Activity learning as a factor promoting motivation

Examples of the argument that activity learning creates or increases motivation are to be found in several quarters. The Upper Secondary Comprehensive inspectors' theme report "Student influence on teaching in the Upper Secondary Comprehensive" (Palmlund 1977, p. 11) states that "... voluntary activisation and co-determination draw with them a motivation that in the long term will give both a more lasting and more comprehensive knowledge than that acquired passively through traditional *ex cathedra* teaching". In the pedagogic literature, Rogers, for example, seems to represent a similar view. If the student himself is allowed to formulate his learning objectives and plan his teaching, he becomes more involved and more motivated to complete his task (Rogers 1969).

The usefulness of the concept of "motivation" has been discussed by, among others, Qvarsell (1976). With her, I would prefer to see the problem of motivation in the context of theories of learning and development and "... analyses of what keeps learning and development going, i.e. the individual active vis-à-vis his environment..." (ibid p. 29). I shall return to this question below.

Theory-of-learning motives for activity learning

The term "learner activity" can designate certain kinds of *work-forms* that occur in the teaching context. The activity in question can involve a student working on a project, performing experiments, organizing exhibitions, writing memoranda, and so on. It seems to be characteristic of these work-forms that the work, the activity, should result in a

product of some kind. But the term "activity" can instead be used to designate the *attitude* a student can have to whatever he is working with. In this way we could arrive at a genetic-epistemological motive for basing teaching on the student´s own activity. It´s not only in school that we learn. Learning takes place continuously, and it can be claimed that the basis of this learning is the individual´s own activity. It can be maintained that the basis of our knowledge is not "a reflection of reality in our senses", but that knowledge arises from our acting in that "reality". One can then further maintain that it is this "natural" learning process that we must try to imitate in the schools. In other words, activity learning.

This view of learning - as a constructive process in the individual - is described in cognitive psychological theory. From a starting-point based on this tradition, I will now go on to discuss the concept of "activity learning" in the school context. By considering what the traditions of developmental psychology and learning theory have to say about the acquisition of knowledge, I will try to distinguish certain central aspects of what we can call "activity learning". Before doing so, I will discuss in somewhat more detail the concept of "activity" as a work-form and as an attitude. Let me do so from the starting-point of the dual concept "theory and practice".

Activity learning and the dual concept "theory and practice"

There is reason to consider how the relation between *theory* and *practice* can illustrate the concept of "activity learning". In an evaluation of two vocationally-geared lines in the Swedish Upper Secondary Comprehensive (Andersson 1978 a and b, Christiansson 1978), it is clearly established that the students themselves see this relationship as one of the most important aspects of education. The question is "... whether it is possible to identify the students´ own view of education and teaching without formulating the relationship theory-practice as an essential dimension in that view", says Christiansson (ibid.).

The terms "theory" and "practice" as used in general debate are both vague and ambiguous. "Theory" can stand for anything between "what you

read in books" and what can be termed "theory" in the scientific context. "Practice" is used both for the application of knowledge and skills, and, in Swedish, for the experience acquired by participation in working life (*praktik* = traineeship, period of employment on the labour market). This means that the school system can be simultaneously accused of being excessively "theoretical" and of being "untheoretical". It is "theoretical" in the sense that it predominantly imparts knowledge linguistically, and "untheoretical" in the sense that it emphasizes the learning of facts, and is concerned only to a lesser extent with explanations and the relationships between facts. But on the grounds of their ambiguity and vagueness "... to deny these terms any usefulness, would be to deny the students their language. It must thus be the concern of pedagogic research to interpret the import of these relationships" (Christiansson, op.cit., p. 194).

What the students mean by theory and practice is naturally something we should ask them about, but another way of investigating the usefulness of these terms is to see how they are used in the literature.

"Practice" (or *praxis*) is a central concept in Marxist theory. As Lefebvre (1968) notes, Marx' own explanation of the concept remained incomplete, but several modern Marxists have treated the subject and they have used the term in different ways. Two interpretations, above all, are of interest in this context, and the one of them is to be found in Mao Tse Tung. "Correct thought can only emerge from social practice; only from the social struggle for production, the class war and scientific experiment - these three forms of practice" says Mao (1967, p. 21). In another context he broadens his definition of social practice to cover the class war, political activity, and scientific and artistic activity (1967, p. 24). Other statements by Mao make it reasonable to see "social practice" as a criterion of truth. This is a position that is open to several objections, and it is not the interpretation I shall be considering here. But to see social practice as a basis for "correct" or "real" thought can also be given a normative interpretation.

It is in my social practice that I discover what problems are worthy of study, and it is there that I see phenomena as they are - not as they

are described. We find a similar view in Dewey. The school system must be linked to social and political life, and it must impart knowledge not only of laws and organizations, but also of how they work, says Dewey in "Democracy and Education" (Dewey 1948).

Practice in this sense cannot be achieved within the walls of the school. The students must go out and study and take part in activities in the community outside the school. The value of this, according to the above argument, is that it gives studies a relevant content of meaning. A closer association between the schools and outside society would by this way of thinking mean studying essential questions at school. In the case of Dewey and Mao Tse Tung (as I have interpreted him above), this plus value is coupled to an overall view of society: in Dewey's case a liberal democracy in which knowledge is a guarantee of that democracy surviving, in Mao's case a view of a society in conflict, in which knowledge is one of the weapons against oppression. But even apart from these philosophical reasons for practice in this sense, it can be claimed that it is of value in that it shows the student what it is important to know. This can perhaps be seen as an interpretation of the motivation argument cited above, and I shall return to this under the heading Motive forces in the learning process.

The second interpretation of practice that I shall consider is expressed in Lefebvre (1968). If Mao Tse Tung is mainly concerned to describe by the term "practice" the external actions of the individual, Lefebvre is concerned to describe how the individual comprehends and acquires knowledge of his environment. "*Practice* is above all action, a dialectical relationship between nature and man, things and awareness...", he says (op.cit., p. 43). In a polemic against Feuerbach, he says: "At the same time as he (Feuerbach) emphasizes the perceptible object, he omits the subjective side of the perception: the activity that shapes the object, that recognizes it, and recognizes itself in it. Feuerbach fails to see in the perceptible object the product or work of a creative activity that is at the same time perceptible and social" (op.cit., p. 43). This is a general description of the individual's posture towards his environment, and this way of looking at the relationship "individual - environment" is dealt with more clearly and in greater detail in cognitive psychological theory. The similarity was observed

by Piaget. "This role played by action (or by *praxis*) has been abundantly emphasized by Marx, who quite rightly went so far as to consider perception itself as an 'activity' of the sense organs." (Piaget 1972, p. 81) I will be considering what Piaget had to say about activity, but first I wish to discuss activity learning from the standpoint of the work performed by certain other Cognitivists.

ACTIVITY LEARNING AS CONCEIVED BY SOME COGNITIVIST THEORISTS

Cognitivist theorists agree that learning or the acquisition of knowledge is an active process. This does not mean that they agree as to how teaching should be organized. We find, for example, entirely different recommendations in Bruner and Ausubel. I will discuss below their respective views on activity in the teaching situation. The Cognitivist theorist who has devoted himself most extensively to actual cognitive process is Jean Piaget. After discussing Ausubel and Bruner I will give a brief account of what he himself has to say about teaching methods, and in the following chapter I will consider in more detail his arguments concerning the cognitive process.

Activity learning described by Ausubel and Bruner

As already mentioned, no agreement prevails among Cognitivist theorists as to the form teaching should take. Bruner, for example, keenly advocates a type of discovery method (e.g. Bruner 1971 a, 1974), while, sa', Ausubel (1968) attacks this approach very strongly. Bruner's argument is based on ideas relating to the "will to learn", and can be ascribed essentially to the motivation group above. Ausubel's main objection to the discovery method and project studies is that they are ineffective.

> "The crucial points at issue, however, are not whether learning by discovery enhances learning, retention, and transferability, but whether: (a) it does so *sufficiently*, for learners who are capable of learning concepts and principles meaningfully *without* it, to warrant the vastly increased expenditure of time it requires; and (b) in view of this time-cost consideration, the discovery method is a feasible technique for transmitting the substantive content of an intellectual or scientific discipline to cognitively mature students who have already mastered its rudiments and basic vocabulary" (ibid., p. 473).

These two criteria it fails, in Ausubel's view, to fulfil.

Perhaps, then, we should look at their views on the actual acquisition of knowledge. This, after all, can be described as an active process, and it may be possible, from such a point of view, to arrive at various conclusions as to how teaching should be organized.

It must be said at once that both Bruner and Ausubel have fairly little to say about the actual cognitive process. In Bruner the human being´s active search for knowledge seems ususally to be a postulate, which he does not further discuss or attempt to demonstrate (e.g. Bruner 1959, 1974). In "Poverty and Childhood" he says, for example, that "Human intelligence is active and seeking. It needs an environment to encourage such action" and that "Action and the search for meaning are guided by intention, self-directed, and help can be provided to sustain such self-direction" (Bruner 1974, p. 177). Bruner comes closest to a description of the cognitive process in his studies on the formation of concepts (Bruner & Olver 1965). In his introductory chapter to "Studies in Cognitive Growth" he hints at a discussion of what might be a psychological explanation, and he seems also to wish to maintain that one essential motive force in cognitive development is a disequilibrium between different forms of representation. Bruner has criticized Piaget´s equilibrium theory for being too general (Bruner 1959) and perhaps Bruner´s version of it is to be seen as an attempt at specification. But Bruner´s representation theory is not unproblematical. Bruner himself discusses the problem of what an enactive representation (representation by action) is a representation of (Bruner & Olver 1965).

Ausubel agrees with Bruner that "thinking is its own reward" (Bruner 1965). "Because meaningful learning provides its own reward, cognitive drive (the desire to know and understand, to master knowledge, to formulate and solve problems) is more important than in rote or instrumental learning, and is potentially the most important kind of motivation in meaningful learning", he says (Ausubel 1968). This, however, says nothing about the activity in the actual cognitive process. Ausubel considers, however, that meaningful learning is an active process.

> "... meaningful learning takes place if the learning task can be related in non-arbitrary, substantive (non-verbatim) fashion to what the learner already knows, and if the learner adopts a corresponding learning set to do so." (ibid., p. 24)

and

> "Since meaningfulness is largely a personal phenomenon, it can be achieved only if the individual is willing to

> expend the *active* effort required to integrate new conceptual material into his unique frame of reference."
> (ibid., p. 366)

Ausubel thus sees the actual learning as an active process in the sense that the learner must interpret the information he receives, and must activate the concepts he possesses in the area in question. But it is the duty of the teacher to structure the material to be learned in such a way as to facilitate the process, and make the learner's task as simple as possible. This emphasis on subject structure Ausubel has in common with Bruner, but unlike the latter he believes that the way is for the teacher simply to tell the student how matters lie. The idea is to exploit the ability of the individual to function on a symbolic plane, and the unique human ability to *communicate* a culture and the knowledge there contained.

Both Bruner's and Ausubel's views of the cognitive process are somewhat unclear. Bruner describes man as a creature who actively seeks knowledge, who is inquisitive and tries to explore his environment - but in Bruner this is by way of being a postulate. He says very little about the basis of this activity, or about how knowledge is acquired. In Ausubel, activity on the part of the student is a necessary for meaningful learning to take place and this view he bases on a theory of meaning. Knowledge is built up by the assimilation of new data in a given structure, and the activity is identical with this assimilation. If one wonders what steers this assimilation and gives it its direction, Ausubel answers simply that "... the desire for knowledge as an end in itself..." (ibid., p. 365).

Piaget is the person who has dealt most exhaustively with the individual's acquisition of knowledge in the perspective of his development from child to adult, but before discussing this I should like to consider what Piaget has to say on the subject of teaching and teaching methods.

Activity learning in Piaget

Piaget has expressed his views on teaching in, for example, "Development

and Learning", "To Understand is to Invent: The Future of Education", and "Science of Education and the Psychology of the Child" x) (Piaget 1964, 1976 and 1972). In his article "Development and Learning" Piaget attacks the view that development can be described as the sum of what one learns. Development is a spontaneous process which includes the entire structure of knowledge, in contradistinction from learning, which takes place in an artificial situation and relates to a limited area of knowledge. We can explain learning in terms of development, says Piaget, but we cannot do the converse - we cannot explain development in terms of learning (Piaget 1964). For Piaget, this means then when we seek ways of teaching we should look for ways that correspond to or can be adapted to the individual's natural cognitive development. Piaget expresses this most clearly when he says, on the subject of teaching in the natural sciences, that

> "Our hypothesis is therefore that the so-called natural bent of the 'gifted students' - who have the same level of intelligence - for mathematics or physics, consists above all in their ability to adapt to the sort of teaching given them" (Piaget 1976, p. 21).

The methods, in Piaget's view, that best adapt learning to the individual's spontaneous cognitive development are types of what we can call activity or discovery learning. The student himself must have the opportunity actively to explore the area about which he is to learn something, and

> "... it is necessary to employ the active methods, which give broad scope to the spontaneous research of the child or adolescent and require that each new truth to be learned shall be rediscovered or at least reconstructed by the student, instead of simply being communicated to him/her" (Piaget, ibid., p. 22).

When Piaget talks of active methods, he is referring mainly to experimental activities. It is by independently planning and performing

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x) When writing this paper I was consulting a Swedish edition of *Psychologie et Pédagogie*. Working out this English version I checked the translations of some quotations with an English edition (Piaget 1977) and found that part two in the book is omitted in the Swedish translation. In this part Piaget discusses the relationship between education and psychological theory and this can make some of my remarks unnecessesary. In some cases I refer to the omitted part in footnotes.

experiments to test hypotheses that one has oneself formulated in order to explain various phenomena that the activity can become part of one's spontaneous cognitive development. This proposition relates primarily to teaching in the natural sciences, and Piaget is able to assert it because he considers himself to have proved that there is a structural similarity between the concepts of natural science, as they are described in the scientific disciplines, and the child's spontaneous development of a conceptual apparatus for the description of physical reality. We know less, in Piaget's view, when it comes to teaching in other fields. We have insufficient knowledge of what mechanisms produce the linguistic structures, or govern our understanding of history (Piaget 1976). But even if our knowledge is inadequate, we know sufficient, according to Piaget, to say that we cannot

> "... content ourselves with providing an abstract teaching (in the humanities, natural science or a mixture of both) that has no roots in the structure and real life of the society as a whole. The teaching must be capable of fusing the different practical or technical, artistic or scientific aspects of social life into a more organic whole. This whole must be related to the view of history as something which concerns civilization in the full sense of that word, not seeing it simply as a parade of political and military events (which are more consequences than the causes of the underlying social events)" (Piaget 1976, p. 63).

The method of teaching that best corresponds to these requirements, in Piaget's view, is that developed by Freinet. This concentrates on developing the students' interests, and on their social development. Piaget considers that Freinet has combined the two most central aspects of cognitive psychology,

> "... that the development of intellectual operations proceeds from effective action in the fullest sense..."

and this also includes

> "... a social dimension since the inter-individual co-ordination of actions and their intra-individual co-ordination constitute a single and identical process..." (Piaget 1972, p. 85).

Opinions vary regarding Piaget's interest in pedagogic issues. Bruner

for example, maintains that Piaget's "mission" is mainly epistemological (Bruner 1971 b), and Ginsburg and Opper (1969) consider that he has hardly dealt at all with the matter of teaching or any other practical applications of his work. Flavell, on the other hand, considers that Piaget was interested in questions relating to teaching from an early stage, and has dealt with them extensively (Flavell 1963). But even if Piaget has always been interested in teaching, and even if he has pronounced, as exemplified above, on teaching methods, he has not described in any great detail the methods he recommends, and when discussing the relationship between them and his theory of developmental psychology he almost makes a plea for activity in the teaching situation. He maintains that knowledge is the result of a constructive process based on activity on the part of the learner, but he has not discussed in any further detail what expression this can take in the classroom.[x] He speaks of cooperation as being important for the cognitive process, but he does not go into the conditions necessary for cooperation in the teaching situation.

Piaget himself has not performed any empirical research in the field of teaching, and he himself has observed the limitations of purely deductive arguments. Pedagogics must be based on its own empirical research, in which the knowledge acquired in psychology is utilized (Piaget 1972). It is important, in such a context, to specify, for example, what activity can mean in the teaching situation, but this is not something we find in Piaget.

Activity learning in Piaget-inspired research

Opinion, as we have said, is divided concerning Piaget's interest in teaching, but almost total agreement seems to prevail as to the great

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x) It is worth noting that he makes a distinction between activity as "functional behaviour based on interest" and "'performance' referring to some external operation of a motor nature" (Piaget 1970) and he holds that it is only the first of these two kinds mentioned that is of interest for the teaching process at every level. But he has not much to say about how this functional behaviour works in the teaching situation (Piaget 1977).

importance of Piaget's research for pedagogics. Flavell (1963) distinguishes between three different ways in which it seems possible to utilize the research of Piaget in the teaching field. First and foremost, Piaget's description of the child's development can be used in the diagnosis of learners, and in grouping them in different levels.

Another way of using Piaget is to use his developmental time-table when structuring curricula. Flavell (ibid.) believes that this can be done in two ways. First, his description of how thinking develops can tell us when different sorts of items can be introduced in teaching. Second, it can help us to avoid the sort of misunderstandings that Piaget has shown to depend on the level of development.

The third application of Piaget's theory involves utilizing the general knowledge it affords regarding the individual's way of thinking and of how "unknown externals become known internals" (Flavell op.cit., p. 366). According to Flavell, this can also be done in two ways. First, we can utilize what Piaget has to say about different forms of knowledge and thought, and how they develop. Under what conditions and in what way does the change from one way of thinking to another take place, and how can this be exploited in teaching? Second, one can try to give more concrete and specific recommendations for classroom teaching on the basis of what Piaget has to say concerning the cognitive process at large.

Flavell (ibid.) chooses to deal with the third application. The two first ways of applying Piaget's theory, wrote Flavell in 1963, have not been utilized to any great extent. The situation has changed somewhat in the past fifteen years. Very little use is made of the general assertions made in the theory regarding the acquisition of knowledge. Almy (1979) says that insofar as text-books in teaching mention Piaget, they discuss the division into stages and say something about activity. Almy discusses Piaget's influence on Early Childhood Education - which she defines as the teaching of children between the ages of 2 and 8. One can then note that much of the school research performed in connection with Piaget is tied to specific levels, and that the bulk of it relates to the lower levels. Of a total of 433 titles dealing with learning and teaching and having a connection with Piaget (the result

of a literature search using data base ERIC), 205 deal with matters that only concern the pre-school age and lower level (elementary school). The search related to literature published between the years 1968 and 1978.

The application of Piaget's theory in the drafting of curricula has become a major field. It is above all in the natural sciences that applications are found. According to Almy (ibid.), more articles have been written concerning the application of the theory to mathematics than any other field. In the above-mentioned literature search, about one third of the articles concerned with the division of the school into levels or stages deal with the natural sciences (including mathematics). Just over one third cannot be directly tied to any specific school subject, but deal with questions relating to intellectual development, above all the development of a physical or logico-mathematical conceptual apparatus.

Only a fairly small proportion of the Piaget-inspired literature on teaching and learning thus discusses the general aspects of Piaget's research, and draws upon these to make recommendations regarding teaching. When a paper does raise Piaget's general description of the cognitive process and discusses its implications for teaching, this is usually done in broad wordings and generally couched advice. Aspects raised include, for example, the importance of a social interplay between students (Ginsburg and Opper 1969), the importance of the teacher being open to the way in which the students think and reason (Scwebel and Raph 1974), and the value of drawing attention to contradictions in the student's conceptual world (Sigel 1969).

Sometimes, great significance is made of Piaget's distinction between what he calls physical (P) and logico-mathematical (LM) experience. Elkind (1972), for example, considers that greater attention should be paid in schools to the "LM content", i.e. to the basic concepts which determine how experiences are ordered and organized. I have tried in another context to demonstrate that Elkind's interpretation of these concepts is doubtful (Halldén 1973), and Egidius (1978) maintains that false interpretations of them have their origins in trans-

lation problems. Piaget himself considers these concepts to be pedagogically important, but as I understand it they are not important in the sense that they imply or establish as a norm any specific teaching techniques. Their importance lies in the fact that they designate two aspects of our knowledge - our knowledge of facts and our knowledge of logical operations, and that they show that both these types are the result of action on our part.

When the general aspects of Piaget's theory are considered in the context of teaching applications, the concept of "activity" is usually discussed. This is often done in very sweeping terms. In the following section I will try, on the basis of what Piaget says about the cognitive process, to specify the term somewhat more narrowly.

ACTIVITY LEARNING AND LEARNING ACTIVITY

The acquisition of knowledge as a constructive process

"There is thus in the beginning neither self nor external world but a continuum", says Piaget in "the Child's Conception of the World" (Piaget 1929, p. 267). The mutual inter-action, or dialectic if you will, between the individual and his environment is a central concept in Piaget. He argues both against a priori stances - which see the basis of cognitive development in the individual's maturity and reflection - and evolutionary or empirical theories - which see cognitive development as reflecting in some way the environment of the individual (Piaget 1935, 1947).

> "The psychological problem begins to pose itself as soon as the reflexes, postures, etc. are considered no longer in connection with the internal mechanism of the living organism, but rather in their relationships to the external environment, as it is subjected to the individual's activity." (1935, p. 24)

The knowledge possessed by an individual is the result of his action in the world in which he lives.

> "... the child does not undergo simply external pressure from the environment but tries, on the contrary, to adapt himself to it (?). Experience, accordingly, is not reception but progressive action and construction: This is the fundamental fact." (op.cit., p. 365).

It is by one's own activities, which initially comprise the reflexes, and through the feed-backs from the environment to which these give rise, that knowledge is developed. The cognitive development of the individual resembles work in the scientific field, where one constructs and develops theories and tests them empirically. Illustrative is Piaget's comment to the fact that a child at the age of seven or eight will employ teleological explanations also to explain physical events.

> "No direct experiment can possibly lead the child to the discovery that a movement is not purposive or that any activity is not conscious." (Piaget 1929, p. 269)

Somewhat loosely, this construction of a "conception of the world" and the development of a capacity for logical thought that is the basis of that conception, can be termed adaptation (Flavell 1963, p. 48). It is in order to explain on what functions this adaptation is based that Piaget introduces the terms "assimilation" and "accommodation", where assimilation can be said to stand for the activity of the individual in relation to the external world, and accommodation for the influence of the environment on the organism (Piaget 1947, p. 21). Assimilation and accommodation thus describe two modes of function in the organism. Assimilation means that the individual refashions phenomena in his environment, either by handling them physically or by translating them into comprehensible categories. Accommodation, on the other hand, means that the organism changes itself in accordance with, or adapts to, the demands made by the environment. An adjustment is made which makes assimilation possible. Accommodation can also be interpreted both on a mental and a physiological or topographical plane - to employ a term taken from behavioural psychology. To be able to acquire a new experience or receive new knowledge, I have to adapt my thinking to the situation to hand. To understand, I must take an inventory of what I already know and set it in relation to the present context. At a physical level, accommodation means I adapt my movements to the material situation; I walk differently on a staircase from when I am crossing flat ground.

The processes of assimilation and accommodation, says Piaget, always occur together.

> "Assimilation can never be pure because by incorporating new elements into its earlier schemata the intelligence constantly modifies the latter in order to adjust them to new elements. Conversely, things are never known by themselves, since this work of accommodation is only possible as a function of the inverse process of assimilation." (Piaget 1935, p. 7)

That assimilation and accommodation always occur together does not imply that the relationship between them is always identical. In certain situations assimilation can be the predominating or leading function, and in others accommodation. Play is customarily regarded as a mainly assimilative activity, and imitation as one that is mainly

accommodative (Flavell, ibid., p. 65, Jorup 1979).

I said above that the individual's construction of a conception of the world, and of a logic, can be called adaptation. This is correct as long as that conception and that logic make it possible for the individual to function in the world in which he lives.

> "There is adaptation when the organism is transformed by the environment and when this variation results in an increase in the interchanges between the environment and itself which are favourable to its preservation" (Piaget 1935, p. 5).

Piaget, as clear from the above, describes the interplay between the individual and his environment by the terms "assimilation" and "accommodation", and adaptation can thus be defined as a state of equilibrium between the assimilative and accommodative processes. Since assimilation stands for the indivudual's alteration - in the broad sense - of his environment, and accommodation for the influence of the environment on the individual, adaptation can also be described as "... equilibrium in the reciprocal relationship between subject and environment" (Piaget 1947, p. 22).

Flavell (1963) observes in a note (p. 47) that Piaget uses the term "adaptation" in somewhat shifting senses. In its most limited sense it means that assimilation and accommodation are in equilibrium, and that neither process dominates. This, in the opinion of Flavell (ibid.), implies that certain actions are more adaptive than others. In its widest sense, the term is synonymous with intellectual function in general.

What, then, does it mean for assimilation and accommodation to be in equilibrium? If we take the above quotation from Piaget, which says that adaptation results in an increase in the interchanges between the indivudual and the environment, and that these interchanges are favourable to its preservation, then both "adaptation" and "equilibrium" become normative concepts. Adaptive functioning, or activity in which there is an equilibrium between assimilation and accommodation, implies action that promotes the existence or development of the individual. If we take, instead, the wider sense of adaptation (intellectual

function in general), it is possible to retain it as a purely descriptive term. It could then be said to describe a situation in which interaction between the individual and the environment is possible. Interaction presupposes that the individual has a possibility of assimilating phenomena in his environment, and this assimilation is a necessary condition for accommodation.

> "... accommodation is only possible as a function of assimilation, since the very formation of the schemata called upon to accommodate themselves is due to the assimilatory process" (1935, p. 410).

Decentering and social elements in the acquisition of knowledge

> "There is in the beginning neither self nor external world but a continuum. The social factors also tend to the same result; from his earliest activities the baby is brought up in a social atmosphere, in the sense that his parents, especially the mother, intervene in all his actions (...) and in all his affections. Thus according to this point of view every action is part of a context, so that the consciousness of self does not accompany the child's early movements in any innate manner but is only gradually revealed as a function of the contacts experienced with the behaviour of others." (1929, p. 267)

A necessary condition for the child being able to see itself from outside, to see itself as an individual among other individuals set in a material context and subject to the demands made by that context is thus, according to Piaget, that the child should interact with other people, and be misunderstood and understood by them. Without this inter-action it would be possible for the child to continue living in the conflict-free world where

> "The most natural idea for him ..., is that all nature centres around him and has been organized by his parents or by human beings in general." (ibid., p. 420)

This idea is a reflection of what Piaget calls egocentrism or cognitive egocentrism.

The term "cognitive egocentrism" stands for an incapacity to change cognitive perspective.

> "Cognitive egocentrism... stems from a lack of differentiation between one's own point of view and the other possible ones..." (Piaget 1962, p.4).

Underlying such egocentric thinking can be either an as yet not attained stage of development, which makes it impossible for the individual to see certain perspectives, or, alternatively, an inadequate equilibrium between assimilation and accommodation, which gives rise to systematic errors. These circumstances mean that

> "... the progress of knowledge never proceeds by a mere addition of items or of new levels, as if richer knowledge were only a complement of the earlier meagre one: it requires also a perpetual reformulation of previous points of view..." (ibid., p. 3).

This corrective process Piaget calls decentering.

As mentioned above Piaget, in "The Child's Conception of the World", sees the social inter-action or dialogue as necessary for the process of decentering. (In later works he sees it as necessary not only for this process but also others.) The dialogue is thus an important part of the teaching situation.

> "One can learn the meaning of perspective... only by pitting one's thoughts against those of others and noting similarities and differences",
> says Flavell, and
>
> "The extension of this view to education consists of plumping for group activities in the class-room - projects to be undertaken in common, discussions, sessions, and the like." (Flavell 1963, p. 369)

Motive forces in the learning process

Birgitta Qvarsell (1976), in her discussion of the concept "motivation", concludes that in its traditional form it is of little value as an explanatory concept for the learning process in teaching situations. An explanation is required that can relate this process to the total personality development and to the individual's handling of his environment.

When Dewey in "Experience and Education" (Dewey 1938) summarizes his view of education, he observes that experiences differ in importance. He discusses how far the students themselves should be permitted to choose what they want to work with. He believes that proposals for subject areas should come from the students, but that the final choice must be made by the teacher. The reason for this is that certain of the experiences acquired in the teaching situation lead to new fields and new questions, while others are final, sufficient in themselves. He says that certain experiences have a lever effect. It is up to the teacher to choose the subject areas and structure teaching in such a way that the students acquire such experiences.

Dewey says very little about what causes certain experiences to have this lever effect. His line of reasoning, however, has certain similarities with Piaget´s concepts of adaptation and equilibrium. This holds true if one takes the normative interpretation of these terms (see above, p. 20 f.). Experiences with a lever effect would then be those resulting in an increased inter-action between the individual and the environment that furthers the individual´s existence. This would imply that one should work, in teaching, with problems essential to the student in the situation in which he finds himself. It must be possible to relate the matter introduced in teaching directly to what the student sees as problems in what he experiences as his situation "in the world".

There are some grounds for believing that a teaching which relates to the student´s picture of himself in society does function. On the basis of three research projects relating to vocationally geared lines of the Swedish Upper Secondary School, we can note i) that teachning functions on the whole fairly well (Axelsson 1977, Andersson 1978 Christiansson 1978), ii) that insofar as it does not function well it is because teaching fails to relate to the situation or future sphere of activity of the students (Andersson 1978, Christiansson 1978) or if it does so relate it is in a time perspective that the students do not possess (Nilsson 1977).

Lennart Nilsson (ibid.) claims that the students and planners have different definitions of what is "meaningful". For something to be

regarded as meaningful by the student, it must be of practical use in the fairly immediate future. The planner does not demand immediate practical utility, but can see the utility of, for example, increased competency, and he has a long-term perspective. It is of interest that Nilsson believes both the view of usefulness and the time perspective to change with increased knowledge. When the student has learned more, his definition of "meaningfulness" will coincide to a greater extent with that of the planner. This is entirely in agreement with the adaptation argument discussed above (p. 20 f.). With increased knowledge, my picture of the world will be broadened and I will thus see more problems in my relationship to the world I am living in.

Generality and specificity

Piaget describes certain general features in the development of the individual. He distinguishes between four factors that are essential in explaining this development (e.g. Piaget and Inhelder 1969). These are physiological maturity, experience in the form of action (actions performed upon objects), social inter-action, and self-regulation in the form of a process of equilibration. The three last of these I have considered above. These factors are supposed to explain intellectual function and intellectual development as a whole. (Piaget also holds that they explain affective development, and one can sense here a special value theory in Piaget. This, however, is not the place for such a discussion.) But of what interest is a general theory of the individual's total development when we look at the teaching situation? Unlike general development, the teaching situation can be characterized as objective-oriented, and its purpose is limited. This I will discuss in the following chapter.

LEARNING ACTIVITY IN THE TEACHING SITUATION

The parts of Piaget's theory that I have chosen to discuss are his description of the acquisition of knowledge as a constructive process and his description of learning as part of the adaptive process. I will try in the following to relate these general aspects of cognitive development to a practical teaching situation. Starting from the description of knowledge as the result of a constructive process. I shall consider the idea that teaching should proceed from a "concrete" to an "abstract" presentation. I shall further consider a demand that learning should involve the properties termed "reversibility" and "associativity". These discussions are followed by an attempt to specify more precisely the concept of "learning activity". Referring to Piaget's concept of "adaptation", I will then introduce the concept of "relevance" and conclude by saying a few words about its implications with regard to teaching methods.

On proceeding from the concrete to the abstract

Piaget says that

> "... the abstraction is only a sort of fraud, unless it is the culmination of a coherent series of concrete events which have preceded it. The real cause of failures in formal education is mainly that it starts in the language... instead of starting with the real material action" (Piaget 1976, p. 84).

Underlying this assertion is the idea that education should be formed analogously to the natural developmental process in the individual. A Central thesis in Piaget is that thinking is internalized action. Piaget explicitly expresses the idea that teaching should imitate the natural developmental process in "Science of Education and the Psychology of the Child" (Piaget 1972). Piaget is speaking about the teaching of mathematics, and he considers the central problem there to be

> "... that of the reciprocal adjustment between the spontaneous operational structures proper to the intelligence and the program or methods relating to the particular branches of mathematics being taught." (ibid. p. 56).

Flavell describes how this should be reflected in teaching:

> "In trying to teach a child some general principle or rule, one should so far as is feasible parallel the developmental process of internalizations of actions. That is, the child should first work with the principle in the most concrete and action-oriented context possible; he should be allowed

> to manipulate objects himself and 'see' the principle operate in his own actions. Then, it should become progressively more internalized and schematic by reducing perceptual and motor supports, e.g. moving from objects to symbols of objects, from motor action to speech, etc." (Flavell 1963, p. 84).

Piaget, to the best of my knowledge, provides no direct support for the idea that teaching should proceed from the "concrete" to the "abstract". Probably he only advocates this thesis with regard to teaching in lower levels, but he is not quite clear at this point. It is true he says that it is only functional behaviour based on interest that characterizes "the active school" at every level, for one can be active in this sense even in pure thought, but he also says that

> "... the reflexive intelligence cannot succeed in creating anything new, in its own sphere of signs and concepts, except on condition that its constructions are solidly based on foundations laid down by the practical intelligence /sensorimotor intelligence/." (Piaget 1977, s. 162).

Indeed, so far as I know, no direct empirical support for the thesis exists. It is true that Bruner succeeded in teaching eight-year-olds second-degree equations with the aid of bricks and scales (see e.g. Bruner 1971 b), and this is a fine example of a progression of learning from the concrete manipulation of physical objects to a mastery of fairly abstract operations. Bruner believes that the learning of mathematics here achieved "reflects in many ways intellectual development" (ibid. p. 84). But the fact that Bruner succeeded in teaching children mathematics by trying to imitate the "natural" course of development does not automatically imply that this method is the best one when applied to adults.

A study that would appear relevant to this problem has been performed by Mager (1961). He reports an experiment in which a number of subjects, mainly graduates, received individual instruction in the subject of electronics. Teaching was based entirely on the student's questions. The purpose was to see what sequencing of the material the students chose. One of Mager's conclusions was that the student, from his point of view, sought his way from a simple, overall comprehension of the subject to a more complex comprehension of the whole. Also, the students

were more interested in, for example, *how* a television works than in *what* makes it work. As Mager says, they were more interested in the function than in the structure. Summing up his results, he notes inter alia that

> "Initial interest was in the concrete rather than in the abstract, in things rather than in theory, in *how* rather than *why*.

and

> "Learners wanted to progress from simple wholes to more complex wholes" (op.cit., p. 412).

In Mager's experiment we seem to find an argument both for starting with the concrete, and for trying to give general, overall explanations. A possible way of interpreting these results so that they give an unambiguous picture might be to discuss the term "concrete". As used when saying that teaching should proceed from the concrete to the abstract, it is fairly vague. In one sense the most concrete thing about, say, a television set is the components of which it is constructed, but it is also possible to maintain that these can only be understood at a high level of abstraction and that the most concrete thing about a television set is the picture on the screen. If one ties the degree of concretion to the person (and to a specific situation and time), it is possible to maintain that one should always start with the concrete: on the other hand, it is very unclear what this involves in any practical situation. Nor is Piaget himself entirely clear on this point. When in "To Understand is to Invent: The future of education" (Piaget 1976) he discusses teaching in the natural sciences, he says that different individuals can have different bents.

> "One can in fact distinguish between those who think strictly deductively (once they have reached the age at which one is capable of that sort of thinking), from those who think concretely and experimentally." (ibid., p. 22).

It seems a fair conclusion that if one takes into consideration only the acquisition of knowledge as a process, then no arguments exist either in favour of proceeding from "the concrete to the abstract" or vice versa. This holds true as long as we do not let the level of concretion be determined by the opinion of a particular person, in a specific

situation, at a given time. This, on the other hand, would mean that we were no longer using the terms "concrete" and "abstract" in their common-sense meaning, and the question is then whether they are any longer useful. It would seem more reasonable to speak instead of "meaningfulness", and say that teaching should start from what is meaningful for the learner: it may also be possible to argue that this starting-point should be meaningful in a particular way. I shall be returning to this argument under the heading "Relevance".

Reversibility and associativity

When Flavell in his great monograph on Piaget (Flavell 1963) speaks of "applications to education", he makes reference to Hans Aebli, who in 1951 produced a work entitled "Didactique psychologique: application à la didactique de la psychologie de Jean Piaget". Aebli claims that since the operational systems of the individual involve the properties of reversibility and associativity, then a teaching program should also incorporate learner activity containing these same properties.

In "The Psychology of Intelligence" (Piaget 1947) Piaget states what conditions must be fulfilled in order to achieve "equilibrium of operative thought". Piaget maintains that when the individual finds himself at a formal operational level, then he is in a state of equilibrium, and Piaget discusses the conditions for this equilibrium. Reversibility and associativity are two of the five conditions laid down by Piaget. The others are composition, general identical operation, and tautology. I do not know why Aebli only considers the properties of reversibility and associativity. Possibly it has to do with the difficulty of seeing what practical consequences the other properties can have in a teaching situation. I believe that the same difficulty exists with regard to associativity and - possibly to a slightly lesser extent - reversibility.

Reversibility has to do with following an argument "in both directions". Flavell gives examples from the teaching of elementary mathematics. One should learn multiplication and division at the same time, and addition and substraction should be coupled together in the same way.

In other contexts it is possible to conduct arguments about cause and effect in an analogous way. When considering the possible effects of a given circumstance, the argument should be linked to a consideration of the conditions that must be fulfilled for those effects to occur. Reasoning about necessary and sufficient conditions should thus be introduced at an early stage of the teaching process. I would question how far this latter is an application of reversibility. An argument about necessary conditions is hardly, in the strict sense, reversible to an argument about sufficient conditions. In spite of which, this recommendation perhaps captures *something* essential in the concept of reversibility.

It is more difficult to see what the demand for associativity could mean in the context of teaching. Associativity

> "... means that the mind is always free to make detours and that a result arrived at by two different paths is the same in both cases." (Piaget 1947, P. 55).

Again, Flavell takes the teaching of mathematics as his example. There, associativity means trying to solve a problem by different methods, or pointing to different, but equivalent, forms of expression (e.g. $2(b + h) = h + b + h + b$). It is more difficult to see what might be a counterpart in, for example, the social sciences. One might conceivably describe the same event at different levels, describing, say, a political situation at a structural, an inter-personal, and an intra-personal level. Another way might be to deal with the inter-acting factors in a course of events in clear isolation from each other, and thus be able to weigh them against each other. Possibly, also, one could work with alternative explanations. But it is doubtful whether any of the interpretations suggested have anything to do with associativity.

I think one comes closest to the sense of "associativity", if one interprets it as a requirement that an event should be described in different ways, in different "media". An event can be described by a picture, as a drama, in ordinary prose, and so on. The question is what one gains by this. It is possible that different manners of presentation serve as an aid to memory, but the point of Piaget's concept of association

is that it should afford greater understanding. Turning to Bruner, one finds support for the idea that different forms of presentation contribute to greater understanding. Bruner bases this argument on his theory of different forms of representation, but Piaget has no corresponding theory and he has criticised Bruner's theory (account by Bruner in Bruner and Olver 1966). The concept of associativity thus seems difficult to apply once we leave the natural sciences.

Learner activity - a more precise specification

Torsten Husén said in 1952 that activity learning

> "... to a great extent finds support in what psychological research has to tell us." (Husén 1952, p. 27).

By activity learning he meant an educational program incorporating such points as independent study, creative work, interest, and activity in general.

> "In brief what we are concerned to achieve is *active* learning, an 'école active'." (ibid., p. 20).

The research in which he finds support is mainly in the fields of learning psychology and social psychology. He also says that

> "... at the same time we cannot avoid adding the proviso that a great deal of the activity learning program has no support in psychological research..." (op.cit., p. 27).

He seems to consider, for example, that the support provided by research in developmental psychology is very thin.

I have discussed activity learning above exclusively with the support of ideas from developmental psychology. This is perhaps partly due to the developments that have taken place in that field. When Husén, in 1952, was discussing the psychological premisses of activity learning, Piaget, for example, was still a relatively unknown name. His most central work on early development, "The Origin of Intelligence", was not translated into English until that year (see e.g. Flavell 1963).

My purpose has also been different from Husén's. He was discussing a pedagogic program, in which activity on the part of the student was one point: I have been trying to find arguments that will give the term "activity learning" or "learning activity" more precise meaning.

One conclusion that can be drawn, if our argument so far is correct, is that activity learning or learning activity should not stand for or be tied up to any specific work-form or work-forms. If a student performs an interview survey, collects data and presents them in the form of a report or an exhibition, works as a trainee in industry, performs experiments, or takes part in work on some larger project, it does not in itself mean that he is active in any interesting sense. Activity should be regarded rather as an *attitude* on the part of the learner to what he is to learn. In this way, activity learning and learning activity are not tied down to certain specific methods of teaching, nor can they be described in terms of the work-forms employed in the teaching situation. Any further specification must instead involve characterizing the attitude or posture that is to be regarded as "active".

It is possible to characterize and discuss learner activity at a high level of abstraction in terms of assimilation, accommodation and equilibrium, and probably in a sense achieve a high degree of precision. This precision, however, can easily be lost when one then tries to apply the concept. If, on the other hand, one tries to characterize learner activity at a common-sense level, the description will be fairly thin, and somewhat fluid. In spite of that I will choose the latter alternative.

An active attitude or mode of thinking is characterized by the individual testing different interpretations of the facts presented to him, and of the experiences he undergoes. He or she will pick out different aspects of a phenomenon, or in a material. In the case of a text, this can mean that one looks for different meanings in it, tries to establish the intentions of the writer, looks at the functions of the text etc. This is characteristic, we can say, of the assimilative aspect of the acquisition of knowledge. Also under this head we can put the testing of existing knowledge in new situations. One seeks new applications of one's knowledge, and tries out the techniques one has mastered on new tasks.

A second criterion of learner activity is a willingness to revise one's existing conceptions. This involves not only the abandonment of conceptions which subsequently prove to be false, but also the modification, development and expansion on one's view of a problem or an event. If the former criterion pointed to the assimilative aspect of acquiring knowledge, this raises the accommodative aspect. To this we can also ascribe the force of will, and intensity, evident in any attempt to understand a phenomenon, a line of argument, a technological function etc.

In the opinion of Piaget (see above, p. 12 f.) the asking of questions and seeking of answers, and the formulation and testing of hypotheses, constitute an essential thrust in the cognitive process, and they can also be seen as a criterion of activity learning. This view can be motivated from the process of adaptation. The search for knowledge is part of the adaptive process, and if the acquisition of knowledge at school is seen as part of the student's total adaptation, then it is reasonable to see the posing of questions as a criterion of learner activity. We have here a built-in requirement of teaching - namely that it can serve as part of the adaptive process - which must be fulfilled in order for activity learning to occur. I shall be returning to this below under the heading "Relevance".

The three requirements I have formulated above are not absolute in the sense that they are present or not present. Neither, accordingly, is learner activity something that is or is not present on any given occasion. It is present to a greater or a lesser extent. These requirements are also so vaguely formulated that it is difficult to decide whether they are independent of each other or not. We should thus not demand that all the criteria should be fulfilled in order to speak of "activity learning" or "learner activity".

Relevance

If teaching at school is to be utilized by the student in his total process of adaptation, an essential factor is the extent to which such teaching affords the student an increased opportunity to orient himself

in life, to see new problems and to ask new questions. Also essential is the opportunity afforded the student to work on these problems, and process these questions. Teaching must be experienced by the student as of interest, and the knowledge imparted must have significance for the student in the situation in which he finds himself and for his future life. This requirement can thus be split into two, namely that the knowledge imparted be *experienced* as relevant, and that it should de facto *be* relevant.

That the acquisition of knowledge should be *experienced* as relevant implies in this context that it will help the student to obtain answers to questions that concern him, or give him skills that he thinks he needs in his present situation, or in situations in which he believes he will find himself.

That the acquisition of knowledge *is* relevant means that it will result in an increased inter-action between the individual and his environment, and that this increased inter-action will favour the further existence of the individual (above p. 20 ff.). We shall thus be imparting knowledge, of which students will have use - in the broadest sense - in our culture. Any determination of what knowledge actually is relevant must have its starting-poin in certain given interests or values.
(A suggestion how this line of reasoning might be developed is to be found in Halldén and Lange, 1978, in the context of a discussion of the demands made on the individual by modern society.)

What is experienced as relevant is an empirical question, and what is relevant is both an empirical and, as mentioned, a normative question. Neither question can we or should we try tc answer behind a desk. The question of what form of teaching best favours a teaching content that is relevant - in both respects - is an empirical question too.

Learning activity, relevance and teaching methods

What, then, can we say about how teaching should be structured to permit and promote learner activity and relevance as described above? It would seem to be a fair conclusion that teaching should be planned by the

teachers and students in cooperation, and that considerable free play be devoted to such planning. The role of the teacher in this work is worth discussing. One solution, after all, would be simply to let the students decide for themselves how they wish to occupy their time. There are two objections to this. First, it could lead to a very narrow teaching content. There is a risk that some large area, in which it is important to possess knowledge, will never be taught. Assuming that the number of problems experienced as relevant increases in step with our knowledge (see above, p. 24) it will be the task of the teacher to introduce new areas by pointing out contexts and indicating perspectives in time. Second, there is no guarantee that the problems raised by the students will have what Dewey called the lever effect. Here, too, the teacher, thanks to his greater knowledge of contexts, and his awareness of different perspectives, can steer choices in a generative direction

Planning based on the desires immediately expressed by the students may lead to teaching that is *experienced* as relevant, but *is* it relevant - in the above sense? I will not speculate on this matter. Obviously, there is nothing whatever to say that it is bound to be relevant. As far as I can see, the extent to which it is relevant will depend on the knowledge of students concerning the culture in which they live, and their own situation in that culture. It should be possible to use the official curriculum as an aid in deciding what is relevant teaching matter. This, however, presupposes that it is based on the values held by the students, and reflects a reasonable view of their present and future circumstances.

When it comes to actual teaching it is difficult, on the basis of the arguments pursued, to accord priority to any specific work-forms and reject others. In view of what has been said about the importance of social inter-action for the process of decentration (above, p. 21 f.f.) one could recommend work-forms based on cooperation between the students, but these can be structured in many different ways and it is not all cooperation that favours decentration (e.g. a strictly controlled group project, in which the only thing evaluated is the result produced).

The discussion pursued thus lends no support to the application of any specific forms or patterns of work. One might perhaps see some form of

project-oriented teaching as a natural recommendation to make, but I cannot see this conclusion as in any way self-evident. The processing of problems would seem possible in numerous different forms of teaching. Perhaps we can say that the discussion suggests considerable openness with regard to work-forms.

Even if this study cannot lead to our recommending any particular teaching technique or techniques, perhaps it could provide a basis for rejecting certain methods as unsuitable. But this, too, I think is difficult. We can say, of course, that a severely structured form of teaching that provides little free play for the initiative and problems of the students is unsuitable, but the question is whether this is not more a matter of how a method is applied rather than any inherent shortcomings. It is reasonable to imagine that certain methods tend to favour strict structuring and limiting initiative by the students, while others favour activity learning and a relevant content of teaching, but these are empirical questions and they should be investigated empirically.

AN EMPIRICAL STUDY OF LEARNING ACTIVITY

During the academic year 1979-80, data are being collected in three classes of the Swedish Upper Secondary Comprehensive with a view to testing the usefulness of the concept "learner activity" as described above. The aim of this investigation is to describe learner activity in different practical teaching situations and set it in relation to certain other variables in the teaching situation. In view of the conclusions drawn above, these are sought in terms of specified requirements that a teaching situation can fulfil, rather than in terms of any general classification of teaching methods etc.

No results of this work can yet be reported, but to give some indication of the type of results to be expected I will describe, briefly, the design of the investigation, and certain observations that have been made during the collection of data. First, however, I should like to say a few words about the possibility of studying learner activities in the sense it has been given here, and consider certain factors in the teaching situation that are probably of importance for learner activity.

On the possibility of studying learning activities

The term "activity" as here discussed is a process within the individual. In other words, the activity cannot be directly observed. It can, on the other hand, manifest itself in external observable behaviour. According to Piaget, all learning involves activity on the part of the individual. It can thus be reasonable to reserve the term learner activity for such activity as finds external, manifest expression. These manifest expressions are defined in terms of the characteristics indicated above (p.31 f.), namely the testing of different interpretations, the testing of new applications of what has already been mastered, the testing and reconsideration of knowledge, and the posing of questions.

I do not consider it meaningful at this stage further to operationalize the concept of learner activity, or the characteristics here indicated. An operationalization presupposes a picture of the situations one is

concerned to describe by one's concept. The class-room situation is an extremely complex one, in which work can be organized in a variety of ways and there is a wide range of possible working tasks. It is thus difficult to foresee what expressions learner activity may take, and if the concept were to be strictly delimited there is a risk that interesting forms of learner activity would be ignored.

The collection of data for the present study is thus not based on any operationally defined concepts, but will instead, we can say, suggest ostensive definitions of these concepts.

Learning activities and other variables in the teaching situation

On the basis of the above discussion, one can make certain assumptions as to what may be necessary conditions for learner activity, and point to certain factors that can be assumed to favour such activity. I shall be discussing *problem-orientation, relevance* and *cooperation* as necessary conditions for activity learning, and as a factor that can be assumed to favour learner activity I shall content myself with a consideration of the *social linkage of teaching*, its anchorage in the community at large.

By *problem-orientation* I mean that the facts and explanations dealt with in teaching are motivated primarily by a problem or subject area that it has been chosen to work on, rather than by any theoretical considerations of subject or method. The problem-orientation requirement has two aspects. In the one case, it means that teaching is planned on the basis of a question, and that the activities pursued are related to that question. If the term "project" were not so infected by its association with a specific work-form, we could have used the term "project". A better term now might be "*perspective-oriented*". If perspective-orientation relates to the structure of teaching, then we could also speak of *objective-oriented* teaching, to designate the extent to which individual pieces of teaching matter have been successfully subjected to the overriding objective. If the students perform an interview survey this may fulfil the requirement for perspective-orientation, but if the purpose of the exercise is lost to students in their nervous-

ness for conducting an interview or reporting the work to the class, then the requirement as regards objective-orientation will not have been fulfilled.

The reason for seeing problem-orientation as a necessary condition for activity learning is closely bound up with the requirement for *relevance*. The requirement for problem-orientation and that for relevance can both be seen as an interpretation of the slogan that schooling should be adapted to the child (cf. above p. 23 f. and p. 32).

I would also regard opportunities for *cooperation* as a necessary condition for learner activity (cf. above p. 21 f. and p. 34). This does not mean that work must be performed in small groups or on joint projects. The important thing is that the opportunity should be given to students to test their ideas in discussions with others - students or teachers.

The *social linkage* of teaching is no guarantee of learner activity, or even of successful teaching in general. Social linkage in the form of recurrent periods of practical traineeship in business and industry, or the private sector, has recently been criticized by the Swedish Confederation of Trade Unions (LO 1979). At the same time, the interest in practical work of this kind is great among both students and educational researchers (see above p. 5 f. and p. 23), and among politicians and those administrating the educational system (see, for example, Gymnasieutredningen/Commission on the Upper Secondary School/, 1976). (We can mention in passing the remarkable fact that in the literature search referred to above /p. 15 f./, the Piaget-inspired research had not concerned itself in the slightest with questions relating to practical experience of working life.) It is thus reasonable to assume that practical experience of working life, and other forms of social linkage, are a help to work in the school, but it is also reasonable to assume that this linkage with the community at large must be arranged in a particular way to be of advantage. It is therefore of interest to couple this social linkage with the occurrence of learner activity.

Guidelines for the empirical investigation

Purpose. The general purpose of the empirical study is to test the possibilities of applying the concept of "learner activity" in discussions on teaching. By pointing to events that can be seen as reflecting learner activity, the term can be made usable in practice. By trying to explain why learner activity does not take place in a given situation, one can discover what we might term "critical events" in the teaching situation. By seeking after and studying learner activity, I thus expect to be able to point to factors in the teaching situation that are essential to the learning process.

More precisely, the purpose can be seen as an attempt to describe and discuss the premisses of learner activity in the teaching situation. This is being done by describing situations in which learner activity takes place and trying to find explanations for the cases where one can expect learner activity but fails to find it.

Given this purpose it is suitable to aim at intensive descriptions of a teaching process, rather than broad comparisons of teaching situations. The essential thing is that the method of data collection used should make it possible to follow the development of a sequence of events. I have chosen to study three classes in which the students, or a group of students, are followed over a fairly long period, and teaching during that period is described. The collection of data is by non-systematic observation, and tape recordings are made where judged possible and suitable.

Selection. Selection, we can say, was in several stages. First, a number of classes was selected for inclusion in the study. In some cases, when the classes worked in small groups, a group was selected and followed. Finally, we can mention the selection of events that are recorded. This choice has mainly to do with the collection of data and the methods applied in it, but the principles of this selection are the same as for the other selections made, so that it is reasonable to mention it at this point.

In view of our assumption that there is no cogent reason to connect learner activity with any specific forms of teaching, I have tried to make the selection of classes independent of the form of teaching. The selection has been steered instead by the assumptions made above (p. 37 f.) concerning the conditions that are necessary for and favour learner activitiy. I have therefore looked for situations

- in which teaching is problem-oriented
- in which the opportunity is given for cooperation and discussion between students, and between teachers and students, and
- in which the subject studied is related to the surrounding community.

As I see it, none of these points so determines the work-form as to exclude fairly traditional class-room teaching. In spite of this, these criteria have led to my studying teaching situations in which work is to a large extent project-oriented, and in which periods of practical work or study out in the community are included as part of the teaching. The selection has thus in practice been made more on the basis of de facto work-form than any theoretical approach to teaching. This is hardly remarkable per se, since the degree to which criteria are fulfilled can only be decided after teaching has been followed over a fairly long period, and this was not possible in the context of the selection.

Apart from fulfilment of the criteria mentioned, I have thought it desirable that the teaching experiments studied should have been teacher-initiated, and that the chances of achieving a good cooperation with the teachers should seem favourable. Also, the body commissioning this study has made certain demands in respect of subject representativity, which has also steered the selection.

In practice, selection took place as follows. The first stage was to seek information about schools in which experiments were taking place that might fulfil the criteria laid down. Contacts were established with organizations and individuals who could be expected to know what is happening at schools in different parts of the country. This gave a list of some 25 schools which were judged to be interesting. It need hardly

be mentioned that this list can in no way be regarded as in any sense complete.

A plan was set up for study visits to the schools on the list. The purpose of these was partly to acquire experience and some frame of reference, but above all to find classes that could be included in the study. The point at which this main purpose could be considered achieved was a matter of judgement, involving a balance between the degree to which criteria were met, the probability of finding "better" classes, the costs of further search, and the possibility of including classes in the field study from the standpoint of travel etc.

The classes that were selected and remain in the study are a second-year class on a 2-year economics line, a second-year class on a 2-year consumption line, and a third-year class on a 3-year natural scientific line.

The selection of time periods and teaching situations was made in accordance with the first three criteria mentioned above.

Notes on method. The main methods used are observation and interview.

Class-room observations are nothing new in pedagogic research. It is difficult, however, to draw on previous experience and use previously devized systems of observation. Such systems are constructed for certain specific purposes and on the basis of theoretical frameworks that can be more, but according to Lundgren (1972) and Gustafsson (1977) are usually less clearly stated, which makes it difficult if not impossible simply to take over a ready-made system.

I have not considered it meaningful to bind the observations to any predetermined categories. Nor, given the purpose of the investigation, is this really possible. It is doubtful, also, whether it is possible to construct a specified system of categories that is applicable to all the types of teaching situations studied. We encounter the same problem here as in the operational definition of activity learning (above, p. 36 f.).

The type of observation employed is sometimes called unstructured or

participant observation. Both terms are inadequate. In the present investigation the observer does not participate in the activities that take place, and, as Bickman (1976) points out, all observation involves making a structured selection of events, even if that structure and the intention underlying the selection can be explicit to a greater or lesser extent. The intentions underlying selection for the present investigation are expressed in the theoretical argument on which it is based.

As regards the practical approach, data have been recorded in several ways. It was originally planned that all the teaching sessions observed should be recorded on tape. I have sensed, however, that the students are well aware of the technical apparatus and possibly experience it as something of an intrusion. I have therefore chosen first to introduce myself, and only at a later stage bring out a tape-recorder and microphones. Many situations are also impossible in practice to tape, for example when the class is working in small groups and then, without previous planning, comes together for a while as a full class.

When a full-class session has been taped, the apparatus used has been a stereo tape-recorder with two microphones suspended as discreetly as possible from the ceiling. The tape-recorder has been concealed in a case to attract as little attention as possible. In these cases, complementary notes have also been taken.

Recordings in small groups were made with a pocket-size cassette-recorder, placed on a desk or in some other suitable position.

In cases where sound was not recorded, notes have for the most part been made in the course of the lesson. This has in some cases been unsuitable, and notes were then made as soon as opportunity permitted, and at latest after school was over for the day.

Planned, regular interviews have been made with a selection of students. These are on tape. The main purpose of these interviews is that they should provide a picture of the student's views on the school and the subject in question, and of his or her views of himself/herself in

relation to school, work, and plans for the future. The interviews also cover the attitude of students to the work-forms employed. These interviews provide the basis of the discussion as to the relevance of teaching. They are what Sjöberg and Nett (1968) call unstructured, focussed interviews.

Supplementary information is also obtained from discussions with teachers and students in connection with observation sessions. These discussions have to some extent assumed the form of interviews. This applies particularly to the teachers. The only reason why I do not speak of teacher interviews is that these discussion situations were not planned, and the teachers were not made aware that we were in an interview situation.

Some reflections on the collection of data

At the time of writing, data are still being collected. It is thus impossible for the present to report any final results. A glance, however, at the data collected provides some picture of what the investigation may be expected to yield, and it is something of this that I would wish to communicate at this point. The statements here made are thus not to be taken as confirmed pronouncements as to what takes place in a classroom, but rather as an annexe to my description of how the investigation is designed. They indicate the guidelines which at present are judged the most interesting for the subsequent work of interpretation.

The first problem we faced was to find some phenomenon that could be designated "Learning activity". Observations were made out in the classrooms, but learning activity seemed conspicuous by its absence. The teaching observed (at this stage mainly a variation of project work) seemed unstructured, messy, and on the whole fairly meaningless.

A preliminary scrutiny of the material, however, revealed certain regularities in this apparently chaotic situation - it seems possible to distinguish a pattern. Such a pattern, it seems possible to trace and describe if one follows the content of teaching, at a content level, and if one follows individual students with a view to discovering what they are seeking in the teaching situation - what their purpose is in

participating in an inter-action. The perspective then applied closely resembles what Marton (1978) calls a second-order perspective (descriptions of the world as it is experienced), which he distinguishes from a first-order perspective, in which "... the intention is to describe the world as it is" (ibid., p. 2). By listening to the individual student, listening to what he says and trying to establish his intention in saying it, it seems possible to confirm the occurence of at least a certain "embryonal" learner activity, and if this is related to the concepts of objective-oriented teaching, cooperation, social linkage and relevance, it seems possible to see a certain pattern.

When I considered the concept of *objective-oriented* teaching I mentioned that the objective of an activity can be outflanked by subsidiary objectives that arise in the course of work (p. 37f.). Examples of such subsidiary objectives are the conducting of an interview, when the object of the interview is forgotten in the fear of having an insufficient number of questions to ask, or of appearing ridiculous to the interviewee etc., or when the reporting of some task to the class is steered by the necessity of speaking for a certain length of time or presenting a certain number of written pages. But objective-orientation (and also perspective-orientation) can also be used to describe how different students attack a subject in different ways. By "learning activity" we can designate the form of an activity, but orientation by objective or perspective also permits us to speak of that activity in terms of content. Certain students appear to have a "philosophical" interest which steers their actions, others look for practical answers to practical questions, others are more flexible in their interests and become involved in questions in an apparently disconnected manner, while others again are steered by the frameworks surrounding the situation and their activities are designed to complete the task set in accordance with the norms they assume to apply. This classification of the way in which students attack a subject is extremely preliminary. However, a possible result of the investigation might well be a description of a number of such personal "learning interests" or "learning strategies" from the standpoint of the students.

A preliminary run-through of the material available to date affords no examples of any *cooperation* that can be seen as part of any learning

activity. We find, however, examples of how the students' different personal learning projects hinder such cooperation. A philosophical interest is in conflict with a conformist interest steered by the established play of the class-room, and so on. However, a closer analysis of the material may provide further angles of approach to this question, and I will leave the matter there.

The problem of achieving a *social linkage* of teaching, and a teaching that the students experience as relevant, is an important one. The teaching sequences obeserved have included both periods of advanced practical training out at workplaces and elements of investigative activity relating to social conditions which one can expect the students to be interested in (e.g. job opportunities for the students in a leaving-class).

In the case of the interspersed periods of practical training, the difficulties - as might have been expected - seem to lie in relating what the students experience during these periods to what they are working with at school. The students appear generally to appreciate their periods of traineeship and there is strong evidence that they learn quite a lot, but it seems to function in almost total isolation from work at the school. This in spite of the ambitious attempts made to link work at the school with these practical traineeships. One possible way of understanding this could be to describe the "context-dependence" of learning (see e.g. Dahlgren 1978, Svensson 1979). This term refers, inter alia, to the difficulty of utilizing strategies for problem solution that have been learned outside the school in the framework of schoolwork, and vice versa (cf. also Lybeck 1978). One can also describe the problem in terms of relevance. In the case of the above-mentioned labour market study, it seems possible to explain much of the students' lack of interest and involvement by their having experienced the task as irrelevant to themselves. People can undergo a course of education for many reasons, and two that appear to be represented in the group studied are the demands made by an existing potential employer as a requirement for employment and, in other cases, the opportunity of a moratorium, during which clear information as to what you "can be when you grow up" is contrary to the actual purpose in undergoing education.

If anything should be said by way of summarizing the lines of interpretation suggested above, it is that the most interesting line to develop seems to be that of the students' different individual "learning projects". Bound up with these, is the relevance of the tasks with which students are working. It would appear fruitful to devote a great deal of the work to describing the relationship between these phenomena as exhaustively as possible.

Finally, a few lines should be said concerning the fact that this study is not to be seen as a criticism of the teaching given, and how such criticism as may be directed against the teaching situations described should not be related to the teachers taking part in the study.

The lack of learner activity can and should be seen as a shortcoming in the educational setting. Shortcomings in the educational field can be explained in many ways. It is sometimes claimed that the students have been so destroyed by a poor home environment and other negative influences outside the school, that the school is powerless. This can hardly be seen as a satisfactory explanation. If the students are difficult, then we must try to develop teaching methods applicable to that situation. The school system bears responsibility for the teaching situation, and it is not relieved from that responsibility simply because the situation is difficult.

As a teacher, it is easy to accept the entire responsibility for unsuccessful teaching. This is natural, since it is the teacher who decides, ultimately, what contract or contracts shall apply to work during the lessons, and also since he is the instrument carrying out the instructions and maintaining the requirements issued by the school system of which the teaching situation is a part. The teacher's view of himself as the most important controlling factor (cf. Svingby 1978) can be contrasted with the markedly modest degree of freedom that is probably accorded him (see Lundgren 1972, 1977 and Gustafsson 1977). In this situation it hardly feels right to come in from outside and criticize teaching sequences on the grounds that they are not optimal from the standpoint of learner activity. I can only say that I think the teachers I have met do an admirable job. When I point to inadequate premisses for activity learning,

this criticism is not aimed at the teachers. Any improvement in the teaching situation is bound to be brought about, essentially, by a change in the external conditions prevailing for the class-room situation.

To emphasize the importance of these frameworks for events in the class-room is not to deny the role of the teacher as a personality. It is conceivable that the conditions applying to activities in the class-room will be easier to handle if the teacher's relationship to the students and to his work is of a certain specific kind, and that certain relationchips between teacher and student will be rendered impossible by a given structure. This may mean that attitudes which are functional in what is now the given structure can conflict with the personal ideals entertained.

SUMMARY

The purpose of the article is to develop a theoretical background for a field study of locally initiated experiments in the Swedish Upper Secondary School with work-forms designed to stimulate learner activity, and to describe the design of the field study. This paper is one of a series of reports from the project Activity Learning and Cooperation, financed by the Swedish Board of Education.

Within this project, a study is to be made of experiments involving the participation of students in the planning of teaching, cooperation between students, and activity learning. The relevance of teaching from the standpoint of the students is also to be studied. "Activity learning" is considered to be the most central of these concepts, and the others are dealt with in relation to this. The discussion is developed within a cognitive frame of reference.

A general survey of how the concept of "activity learning" has been handled by cognitive theoreticians shows that they often quite simply postulate the value of activity learning, or deal with its anchorage in psychological theory in fairly general terms.

From the starting-point of Piaget´s description of cognitive development, "activity learning" or "learning activity" is described as an attitude or mode of thinking on the part of the student to that which is to be learned. This mode of thinking is characterized by a willingness to try different ways of interpreting the facts presented, to study a phenomenon from different aspects, and to test the range of one´s knowledge. This can be termed the assimilative aspect of the acquisition of knowledge. "Activity" is further characterized by a willingness to change one´s mind, to modify, develop and improve one´s view of a problem, and by the intensity of the efforts made to understand a phenomenon. This is termed the accommodative aspect of the acquisition of knowledge. One conclusion drawn is that learning activity in the sense described cannot be directly related to any specific methods of teaching.

The article concludes with a brief discussion of the field study now

under way, the purpose of which is to describe and discuss the premisses for learner activity in the teaching situation. Teaching is being studied in three classes throughout the academic year. Certain guidelines for the processing of data are discussed. In the present phase of the investigation, the most fruitful line to pursue would appear to be how different learning projects relates to personal learning interests and different learning strategies.

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