UNDERSTANDING LANGUAGE ACQUISITION

The Framework of Learning

CHRISTINA E. ERNELING

State University
of New York
Press

CHAPTER 1

Learning: Going Beyond Information Given

THE TWO PROBLEMS OF LEARNING: PRODUCTIVITY AND THE FRAMEWORK

When a newborn human infant confronts its environment for the first time it is a helpless creature which is totally dependent on others to satisfy its needs and cope with dangers from the environment. In many respects the child is more helpless than any other newborn species of animal. Yet, in a few years time and under normal circumstances, it will acquire knowledge and a remarkable ability to deal with its surroundings. And unlike any other animal the child will talk and be talked to, and will have incorporated into its language some of the accumulated social and cultural lore of its elders and its society. The helpless infant transforms into a talking, thinking being, actively involved and contributing in a small way to its cultural and intellectual heritage. The child not only transcends its instincts in a certain sense but also goes beyond its own limited experience, and is able to deal in a culturally and linguistically appropriate way with novel situations and problems personally never encountered before. All this can only happen because a child, having mastered its mother tongue, can understand and produce a potentially unlimited number of new sentences. Instincts, or innate tendencies, and experience are both necessary but not enough for the acquisition of language and knowledge.

How then are we to understand the acquisition of knowledge, and the understanding and the mastery of language? What are the conditions under which individual children learn in order to master the language spoken in their environments, to master concepts and acquire knowledge about the world? What is the relation

between the child's initial instincts and later knowledge, and what is the role of experience? The quest to understand the conditions for the acquisition of knowledge, not only in the child but in the adult as well as in science, has a long history in philosophy. More recently, since the emergence of developmental psychology, the same questions are asked in a new framework, and answered in quite different and sometimes mutually exclusive ways by different theoretical approaches. This book is an attempt to show that during this century there has been some progress in both identifying and solving the conceptual problems involved in understanding learning, especially language learning, but much still remains to be done. This chapter aims to present what I take to be the fundamental problem or conceptual dilemma for any theory of learning, and to show how several historical attempts to explain learning have overlooked this or failed to solve it. The recent interest in the learning of language, as especially expressed by N. Chomsky, his follower J. Fodor and the later Wittgenstein, has given us, if not a successful theory of the learning of language, at least a better understanding of what needs to be done.

The issue being addressed concerning learning, especially language learning, is not so much about rote learning or mindless repetition of what experience provides, nor the change in an organism's cognitive abilities due to some chemical or physiological change, though all this must play a part,[1] but concerns concept formation, language acquisition, the growth of knowledge and understanding. Once something is learned in this way, the knowledge can be extended to new situations. Compare, for example, a pupil who has memorized a number of multiplications by heart and is able to solve the problems memorized but is unable to solve new problems, with the pupil who has had the same exposure to examples of multiplications but who is able to cope in addition with new problems. The latter case is a change in the pupil's cognitive ability to deal with certain types of problems, while the former involves merely mechanical repetition. Both use what they have learned through experience, from a teacher or from a book, but one is able to go beyond experience in utilizing it. How this happens, or can happen is, in a nutshell, one of the fundamental problems of learning, no doubt.

Approached in this way learning is a process of change or alteration—as a consequence of relevant experience, but not

determined by experience—of the individual's cognitive capabilities. How can we account for this change, its starting point, its character, and so on? How should the cognitive abilities be characterized? Are they instinctual and adaptive behaviors, or are they mental problem-solving strategies? Answering these questions in detail involves much empirical study, but before this can be undertaken the conceptual issues involved have to be clarified. Without conceptual clarification the empirical material will be difficult to interpret and progress in understanding a phenomena slow.

> For in psychology there are experimental methods and *conceptual confusion.*[2]

With this remark Wittgenstein, who himself was deeply interested in language and different psychological problems, wanted to draw attention to the fact psychologists and many other scientists often equalize research with the collecting of facts thus forgetting that research also involves an understanding of which problem(s) the facts are supposed to solve. This cannot be separated from the collection and interpretation of facts. The aim of this book is not to add to the collection of facts about how children learn language, but to lay bare the fundamental logical or conceptual problems that any explanation of learning, especially language learning, has to face. I will show how different way of approaching and making sense of what we already know about language learning have failed partly because the conceptual framework has been inadequate. I will thus argue that one of the most difficult problems, among many to be faced, is to clarify what is entailed by going beyond information given in experience or innate endowments, and how it can be accounted for. To do this I have chosen to discuss two influential but opposed solutions to this problem, the later Wittgenstein's and Jerry Fodor's.[3] This, I hope, will clarify some of the issues involved, and on the basis of this discussion, I will present a sketch of an empirical theory of going beyond information given when learning a language. As I will later show the two thinkers just mentioned are both well aware of some of the conceptual problems involved in understanding the possibility of learning language and have both come up with interesting but ultimately unsatisfactory "new ways of looking at old facts." They both, and especially Wittgenstein, though, can help us find a new understanding of language acquisition.

Before turning to these more theoretical problems it is important to distinguish learning both from growth or maturation and from genuine creativity. Learning involves both maturation and genuine creativity, but understanding these on their own is not enough to understand what going beyond information given in, for example, language acquisition, involves. Growth and maturation are associated primarily with the emergence of the organism's biological or physiological characteristics in a rather fixed and determined order, and not with the acquisition of language and knowledge. This separation has been contested by Noam Chomsky in his book *Rules and Representations* (1980).[4] Here he argues that mechanisms like growth and maturation, which successfully explain changes in physiological systems, can also explain language learning. Theories of learning are only invoked to explain creativity, by which he means acquisition and concept formation in areas of knowledge which are on the border of, or just beyond, our cognitive abilities. I think Chomsky is correct in pointing to creativity as one of the central problems of learning, but mistaken in thinking that creativity in the sense just mentioned can be explained by psychological theories of learning. First, genuine creativity, like radical conceptual innovation or the invention of a new linguistic entity, cannot be explained by any theories, whether they are couched in terms of learning or not. The reason for this is that if we are in the possession of a theory that explains radical conceptual innovation we would already, in one sense, have made the innovation. The innovation may not be explicit in the theory, but it would only be a matter of working something out, not going beyond what we already know. Although innovation in art or science must build on what has already been achieved in the field in question and be a result of human mental/psychological activity, it can not be predicted on basis of previous scientific or artistic achievements, or on the basis of a psychological theory of cognitive functioning. Of course, what is an innovation for the individual learner need not be radical innovation in this sense, but then we are no longer speaking of extending the borders of our cognitive capabilities. If this is correct, and in other writings Chomsky seems to agree, *this* radical creativity is not a problem of learning.[5] The problem involved in learning is more like the creativity that occurs in everyday or mundane situations. For example, a pupil can apply

a very simple arithmetic rule beyond the examples he or she has already calculated. Or, as Chomsky himself has pointed out, every normally competent speaker can understand and produce utterances never encountered before. Other skills such as driving a car or operating on a patient's appendix deal with new situations on the basis of acquired knowledge, so explaining these is also the object of learning theories. Hence the problem of how learning or change in knowledge is possible confronts us not so much in the creative artist or the scientist, but in most everyday situations whenever our actions are not mindless repetition or habit. Without question, though, the problem of going beyond information given and learning, gets its sharpest formulation when we consider how a helpless infant who seemingly knows nothing becomes a speaking, knowing being. How is it to be accounted for? How are we to understand the framework of prior knowledge or ability, of experience and social interaction which makes this possible?[6]

There are two fundamental puzzles that any learning theory has to confront, namely the problem of creativity or productivity, which has already been mentioned, and the problem of the basic framework, namely the problem of the starting point or basis of learning, which acts to define the boundaries of what can be learned in a given area. These problems create a puzzle or a dilemma because they pull in different directions. The first problem deals with the way all learning involves moving *beyond* the limits of what was previously known, while the second problem seems to imply that any moving beyond is impossible. The problem of creativity refers to the ability of language users or thinkers to produce or understand sentences or thoughts which are new to their experiences,[7] and the tendency to go beyond particular experiences to general knowledge, that is, to go beyond information given. Once something is learned or acquired this knowledge can be extended to new situations or contexts. For example, as already mentioned, one can learn the multiplication tables by heart, and be able to give correct answers to all cases of multiplication one has learned. Or, one can learn the tables in such a way that one is able to deal with, not only the cases one has been confronted with in the learning situation, but also with cases of multiplication never encountered before. The last indicates a change in the pupil's ability to deal with certain types of new sit-

uations, not only a passive repetition of a finite set of cases. On the basis of practicing a finite set of examples of multiplications a pupil can do a potentially infinite set of nontrivial multiplications. Experiencing a few instances of a certain object or event the learner generalizes to all objects or event of the relevant kind. Even more fundamentally, using words and concepts necessarily involve going beyond individual experiences.

> when we want to describe them we must necessarily make use of words; and these words and the propositions they form must by the nature of the case have a meaning of a more general nature than the single and individual experiences they refer to.[8]

The problematic hinted at here, namely that all our experiences are unique events, yet are subsumed under the same concepts, is not unique to the problem of learning but is a special case of the problem of induction, namely the generalization from a finite set of instances to a potentially infinite set. One example of this is the generalization "All swans are white" based on the observation of a large, but not indefinite number of swans; another is applying the word "table" to a new instance of a piece of furniture similar to what one earlier has called table. Yet another is the assumption that just because lightening has been followed in the past by thunder, this will happen the next time one is observing lightning in close vicinity. In all reasoning, everyday, scientific and even in using language, the principle of induction, or going beyond information given, is utilized.[9] Any theory of learning has thus to confront one of the perennial problems of philosophy.

Not any occurrence of a new sentence, thought, or generalization counts as an instance of learning. The new instance cannot be a random utterance or action, but has to meet certain standards or criteria. Depending on what is learned, it has to be justifiable in light of a body of knowledge, or of a grammar and so forth. It has to be intelligible, understood, or meaningful, and it has to be connected in a nonarbitrary way both with experience and with what is already known, that is, it has to fit into an already established framework of knowledge or experience. It also has to be applied or used in a systematic way when confronted with new experiences or knowledge. Furthermore, a framework of knowledge or at least a mechanisms for sorting,

incooperating or even rejecting what is encountered is needed for learning from experience. To benefit from experience the learner has to sort relevant experiences (e.g., speech sounds) from irrelevant experiences (e.g., other sounds), and connect these with other relevant experience or information already possessed. But to do this the learner already has to have some idea of what is relevant and what is not, that is, the learner must already have some basic grasp of what is to be learned. This brings us to the second puzzle—the problem of the basic framework, namely that unless one already knows something, or has some basic knowledge or set of assumptions, it is impossible to learn something new. Just as the puzzle of productivity can be understood as a special case of the problem of induction, the idea of the necessity of an underlying framework is exploited by proponents of relativism. The relativist claims that mutual understanding is impossible between different cultures, different historical times, or between different scientific theories unless there is a framework of shared assumptions. Someone claiming that it is impossible for someone who does not have children (i.e., lacks the relevant first hand experience or knowledge) to understand the worries involved in raising children, or someone claiming that it is impossible for men to understand women, is a relativist in the sense of saying that it is impossible to understand or learn something new unless on already has the relevant knowledge. Historians or anthropologists claiming that it is impossible to use Western concepts and ideas to understand other cultures are making the same assumption. Other well known examples of the same idea can be found in contemporary philosophy of science. For example, to use Kuhn's terminology,[10] unless two scientists share a paradigm or set of shared assumptions, definitions, and procedures, which serve to delimit their scientific field, communication and understanding is impossible. This implies that scientists from different paradigms cannot understand the problems and their solutions in that of the other, and hence can not learn from it, unless they translate it into their own conceptual scheme. But this translation is always incomplete because the concepts have no counterparts in the other system. Newton's physics, for example, was not an extension and improvement of Aristotle's theory, but introduced a radically new way of conceptualizing the phenomena studied. Newton's theory was incommensurable with

Aristotle's and physicists schooled in Aristotelian physics are unable to use their knowledge to understand and learn from Newtonian physics. In adopting Newtonian physics, physicists had to give up their old way of understanding physics and "convert," perhaps even to some extent, uncritically or irrationally to the new theory. It is impossible to learn an alien paradigm that is incommensurable with the paradigm one is operating within. It follows that communication, discussion and learning is only possible within a paradigm or shared framework of assumptions and beliefs related to the area in question. Does this mean that all learning involves prior knowledge of the type one is learning? Does this imply that an infant learning its native language also has to know what it is learning, that is, that it already possesses a body of relevant knowledge? Does it mean that one already has to possess the knowledge one is learning, hence learning is really a myth? This problem is not new and was already stated by Plato in *Meno*:

> a man cannot search either for what he knows or for what he does not know? He cannot search for what he knows since he knows it, there is no need to search—nor for what he does not know, for he does not know what to look for.[11]

Given this should we conclude that learning is impossible and that productivity or the ability to generalize is only appearance, or even a myth? The paradox seems to imply the impossibility of learning something new, yet acquiring something new is at the heart of learning. Can both these poles—the going beyond information given, and the necessity of already knowing what one is learning be reconciled? Is it possible to go beyond information given, and if so how? This is the fundamental dilemma that has to be faced in understanding learning; is a trade off between productivity and the framework possible? If so, how?

All learning theories have to deal with this problem and in doing so they are forced to make explicit *firstly* the nature and characteristics of the framework or basic assumptions, or more generally the unlearned givens from which learning has to start. To avoid infinite regress of new knowledge building on old knowledge there has to be something unlearned, but given the puzzle of the framework discussed above, this seems to have to be fundamentally the same as that which is learned.[12] *Secondly*, the nature of the relationship between what is known and what

is learned has to be specified along with the nature of the process or mechanism which makes this possible, that is, in what ways new knowledge connect with what is already known. *Thirdly*, since we defined learning as a change in knowledge due to, but not determined by experience, the role of experience has to be accounted for. *Finally*, since not anything new counts as an instance of learning, the standards or limits of the change in learning have to be made explicit.

To further illustrate the problems of learning, especially the tension between productivity and the framework, I will briefly analyze some paradigmatic historical attempts, found in the already mentioned dialogue by Plato, and the English eighteenth-century philosopher David Hume, arguing that they are unsuccessful. I will then state what I see as important improvements over these traditional solutions.

HISTORICAL ATTEMPTS TO SOLVE THE PROBLEMS OF LEARNING

Historically the problem of learning and the issue of productivity and the framework were seen as part of epistemology or the theory of knowledge, and the two main traditions of rationalism and empiricism provide two different and mutually incompatible attempts to account for the possibility of learning. Rationalism characterized learning in terms of inherent or inbuilt reason, which functions independent of experience. Although experience could have a role of triggering or activating the inherent reason it could never change its fundamental structure or content. Empiricists, on the other hand, saw learning as a result of the association of ideas given to the mind by experience. This associationistic approach was taken over by nearly all learning theories which emerged as psychology established itself as an independent discipline in the late nineteenth and early twentieth century. Opposition to this approach came first from Gestalt psychology and later from information processing theories, cognitive and ecological theories.[13,14]

One way to characterize their disagreement is to say that they disagreed about the nature of the framework, with the associationsits saying that the individual mental framework is relatively poor. The mind only contains mechanisms for association

and all else is provided by experience. Protesting this the Gestalt psychologists, information processing and cognitive theories claimed that the mental framework necessary for learning contains much more, either in the form of actual knowledge or at least elaborate structures for analyzing experience. They also differed on the issue of productivity, or the learner's ability to go beyond information given. The associationistic theories characterized this in terms of new material from experience and a process trial and error in contrast to the rationalists' view that productivity amounts to working out or making explict something already in the mind. The dilemma created by the tension between the framework and productivity was never addressed explicitly by these early learning theories and mirrored the failure of traditional philosophies to adequately solve the two fundamental problems of learning (i.e., productivity and the basic framework). I think this failure is best illustrated by brief sketches of two paradigmatic solutions, namely Plato's theory of innate ideas as an example of rationalism and Hume's empiricism. This also serves as a discussion and illustration of the difficulties involved in the two problems of learning.

The natural starting point for such a discussion or inquiry is Plato's dialogue *Meno*. In this dialogue a young Athenian, Meno, asks Socrates to answer the question: "Can virtue be taught?" This leads to a discussion of what virtue is because Socrates insists that we cannot claim to know if something is teachable unless we know what it is. Socrates and Meno, though, fail in their joint attempt to define virtue and this leads to the conclusion that unless one already knows what virtue is one cannot learn it, hence their whole discussion is fruitless. Here the fundamental problem, already mentioned, is stated in terms of a paradox. If one already knows what one is learning there is no need to to learn it, and if one does not know what one is learning one does not know where to find the new knowledge. Does this mean that the quest for new knowledge is hopeless and just a myth both in the individual and for human beings as a collective, in science? No, not even Plato thought so, and immediately after stating the paradox he attempts to show how new knowledge is possible, arguing that knowledge which is new to the individual, or new on particular occasions, even if not new in a fundamental sense, is possible.

Socrates, in answering the paradox claims that the soul is immortal, it has at one time seen and known all things. Learning is really a recollection of what was known before.

> As the whole of nature is akin, and the soul has learned everything, nothing prevents man, after recalling one thing only—a process man calls learning—discovering everything else for himself.[15]

As Socrates illustrates in questioning a slave boy, the boy recollects or recalls geometrical truths simply by being presented with verbal or visual examples of the truths involved.

This account depends on a distinction between latent or implicit knowledge and actual or explicit knowledge. The new knowledge is knowledge one already possesses latently. Through "learning" it becomes actually present to the mind. The slave boy under the questioning of Socrates, not only gets rid of false beliefs, but becomes aware of knowledge latent in his mind. Once some of this knowledge has been made actual, he is also able to work out further consequences of what he already knew, but had forgotten. The slave boy has learned something, acquired knowledge which is new to him on this occasion. But what has changed is not the content of what is in the boy's mind, or the content or structure of the knowledge itself,[16] but the slave boy's relation or attitude to it because he has become aware of, or knows, something he didn't know before. So that which the pupil has to know in order to learn something is *the same* as that which he learns.

Hence the claim of the paradox, that one has to have knowledge to learn something, that learning always involves prior knowledge, has not been violated, yet there is room for productivity of sorts. At least particular individuals on particular occasions can go beyond knowledge already given, in the sense of making knowledge that is latent actual to the mind. What was once known but forgotten is re-presented to the mind. In this sense it is new, but since it was already known before in a fundamental sense it is not new.

The possession of latent or old knowledge is, though, not in itself enough for learning or going beyond information given. Learning is not spontaneous, not generated by the mind alone, but something is needed to get the process going. The slave boy is asked leading questions and is confronted with examples to

which he either assents or dissents. Here experience clearly plays a role in learning because without it recollection or learning does not take place. But what role does experience play according to Plato? In *Meno* experience seems to trigger or release latent knowledge, which then independently of experience is extended or further developed by the mind. But in another of Plato's dialogues *Phaedo*[17] this fundamentally causal role of experience is questioned since to be reminded of something, to recollect something we have to see similarities or the relevant connection between what experience provides and what is already known. Experience has to be acknowledged as relevant and only then can it aid in recollection. Again, one has already to know what one is learning. Once experience has played its role the process of learning seems to be a process of deduction, that is, of working out or deducing consequences of what one already knows:

> nothing prevents man after recalling one thing only—a process which man calls learning—discovering everything else for himself.[18]

In this model further learning clearly is a matter of deductive reasoning, that is, reasoning where the conclusions follow necessarily from the premises and hence can be said to be already contained in the premises. This is not implausible given Plato's example of geometrical knowledge which is a prime example of a deductive system. But what about learning empirical truths, for example whether or not a particular plant is poisonous? Or who won a particular battle? Or what about color terms, where there seems to be no deductive relation between them? Knowing what red is like does not help one deduce what green is like, just like knowing about a particular battle in the First World War does not help one to deduce or learn about what happened during the Second World War. Some knowledge is not related in a straightforward way to what one already knows. This is a challenge to Plato because this seems to be a case of learning something genuinely new, something not entailed in one's innate knowledge. The question remains—if not all knowledge is like geometrical knowledge, how are these other things learned? Is it possible to go beyond information given?

With this in mind Plato's theory leaves us with the feeling that not much is gained, because the end result of learning is just a representation of what one already knew. The learner has not gained

new knowledge, but only changed his or her attitude to something that has not changed. So, are we left with the paradox unresolved, are we left with a static framework and unexplained creativity?

Not necessarily, because what the paradox implies, I think, is not that to learn something one has to know exactly and fully the thing one is learning. To use Plato's metaphor, it is clear that we can search and recognize something which we haven't encountered before, or even had a full description of. It is true that if we have no idea of what we are looking for, we cannot recognize it, but it does not follow that we have to know everything about it to recognize it, or for that matter where to search for it. If this is correct the new knowledge has to be intelligible to the learner, that is, it has to fit with something the learner already knows, but it does not have to be a replica of what is already known. Hence something is needed, but it is not necessary that one has to have a permanent, unchanging preexistent structure of knowledge. It is not even (logically) possible that new knowledge builds on old knowledge, because it is possible, (although extremely unlikely), that without learning we acquire a new framework every five minutes or so, for no cause at all, or for a cause that would not count as learning.[19]

A version of the last is what the empiricists have assumed in their account of learning. What is known without learning or "given," that is, the framework which new knowledge builds on or is developed out of, is sense experience. They see learning as a function of experience. The individual learner notices or rather receives certain experiences or images, which when repeated in a certain sequence become associated with one another. Different images of sense experiences get combined or changed to yield new compound ideas. In this way what is given in experience together with the combinatorial tendencies of the mind gives rise to new knowledge. In David Hume's words:

> and that all this creative power of the mind amounts to no more than the faculty of compounding, transposing, augmenting, or diminishing the materials afforded us by the senses and experience.[20]

Does creativity here, as well as in Plato's account, only amount to the rearrangement or re-presentation of what is given? Let us consider Hume's account of causation as an example of going beyond information given to see if he can account for productivi-

ty. The causation of one event by another is not directly given in experience, it cannot be simply observed or experienced. We only see a set of separate events or actions, for example, one moving billiard ball touching another and the second moving, not the causal relation between them. But he argues that repeated observations of events occurring together result in the habit of expecting the events in question to occur together.[21] In this case the human mind is able to go beyond what is given in experience to new knowledge, by utilizing an internal response or habit to link certain things together. According to this view, the mind is not an instrument for the passive re-presentation of what is given (in experience), but actively creates something new. New knowledge is possible in two ways—experience constantly provides new building blocks and the mind is combining and recombining these. No latent knowledge is necessary, only experiential input and the mechanisms of the mind for combining knowledge.

But already Plato had seen some obvious problems with any such approach. The mere enumeration of examples of virtue, shape, or color cannot teach us what virtue, shape, or color is because if we do not know what the examples are examples of, we cannot look for relevant features, and the like, and then we, of course, cannot learn that all cases of a particular thing or characteristic have something in common. For example, someone pointing to pictures of the Sears Building in Chicago, the CN Tower in Toronto and the Empire State Building in New York City could be trying to teach me what a high rise is, but unless I already know this I could just as well take the pictures to be examples of ugly buildings, or expensive buildings, or North American buildings and so forth. Some prior knowledge is clearly required to learn from the enumeration of examples or other experiences. In the case of causation, to observe a sequence of events as similar presupposes that they are recognized as similar. In that case one already has acquired the relevant generalizations, or the relevant habit. In other words, one has to know what one is learning.

But there is an additional related problem with the empiricistic account. Because all knowledge transcends experience, the empiricists' account of learning quickly runs into an extremely difficult and persistent problem, namely the problem of induction and/or the problem of the underdetermination of theories based on experience. The problem of induction has been formulated in many different ways, but basically it is the problem of the justification of inference from particular instances of a certain kind to all instances of the kind in question. For example, from having experienced the sun to rise every day of our life we conclude that it will always rise, but of course nothing in our past experiences guarantee that the future is going to be the same. Saying that our past expectations have always been fulfilled in the past and thus will be so in the future is only another example of making an inference from particular instances (past experiences) to all instances of fulfilling one's expectations.

The problem of induction can be formulated or approached in another way which is equally challenging to the empiricist account of learning. The so-called 'new riddle of induction' was formulated by the American philosopher Nelson Goodman (1972).[22] It deals with the problem of if and how we, from a finite set of experiences of a particular kind, are justified in drawing one conclusion rather than another. For example, suppose that all emeralds we have observed up to a point *t* have been green. This would support equally well the generalization that "All emeralds are green" as the generalization "All emeralds are grue," if 'grue' stands for the property of being green up to point *t* and blue thereafter.

If experience is underdetermined in this way, that is, indefinitely many conclusions or generalizations can be drawn from experience, how is learning or new knowledge ever possible unless the mind is equipped with a set of hypothesis limiting which conclusions are justified? We seem to be back at Plato's paradox. If these problems are at the heart of learning, how is the acquisition of knowledge possible unless we already possess the relevant knowledge in question? Moreover, how is it possible to learn something new, to go beyond information given by experience or the mind? How is it possible to go from something finite to something universal or potentially infinite? Let me turn to some more contemporary attempts to deal with this problem.

CONTEMPORARY SOLUTIONS: SKINNER, CHOMSKY, FODOR, AND WITTGENSTEIN

During this century one of the most influential developments of empiricist theories of learning was behaviorism, especially in its

formulation by B. F. Skinner.[23] Like earlier empiricists, he takes learning to be a function of experience. Skinner developed a theory of reinforcement to account for the development in the individual animal or human being of certain ways of responding. A rat, for instance, learns to run a certain way through a maze if there is food at the relevant turns. In the case of learning about the physical environment the reinforcement is the positive feedback, analogous to the food in the case of the rat in the maze. In the case of learning social behaviors, like speaking a language, the reinforcement is other people's approval or disapproval of what the child or learner utters. In all learning the starting point is randomly emitted behavior which through reinforcement is shaped and selected to become appropriate to the relevant environment.

In order to account for language and language learning Skinner sought to identify the variables in the environment that control and determine verbal behavior. He argued that the verbal behavior of a person could be predicted and controlled by manipulating the environment of the speaker. This manipulation of the environment is the "essence" of learning. Thus, the child's random babbling would gradually become like the language spoken in its surroundings, because only the sounds and sound combinations similar to that language would be rewarded by the parents and other speakers. In this way the verbal community sets up reinforcements schedules which select and shape the child's verbal behavior. The child comes to utter the correct things in the correct situation; for example, say "the door is open" when the door is open. The child's future use of language is determined by past responses and reinforcement schedules and can be predicted if these are known. To understand learning, on this account, one does not have to assume or take into account any internal structure of the learner's mind, nor assume anything about how it processes information or organizes behavior.

I do not think Skinner saw his behaviorism as an attempt to solve Meno's dilemma that we already have to know what we are learning, but it is an improvement over more traditional empiricist theories, like Hume's, in this respect. This is so because the individual does not "need" to recognize what is a relevant response, or what stimuli are relevantly similar, because the physical and social environment does this by rewarding only certain responses relative to certain stimuli. The child does not

have to know or recognize that certain responses are appropriate to certain stimuli, or even recognize stimuli and/or behavior as similar, because this is taken care of by external "forces" like rewards and punishments. Although this suggests a solution to Meno's paradox, Skinner's view that past experience and behavior determine future behavior is problematic, that is, it cannot account for productivity. It has difficulty explaining such a common occurrence as "over-regularization," where children make grammatical mistakes by using a grammatical construction just learned in an inappropriate context. It even has more difficulty in explaining that all normal speakers constantly understand and utter sentences never heard before.[24]

The most forceful criticism of Skinner's project has come from the linguist Noam Chomsky, who in his well-known criticism of Skinner's behaviorism and in numerous other writings has pointed out that our language is creative, or productive.[25] We are not limited in understanding or speaking to what we have earlier heard but can, and do as a matter of fact, say and understand linguistic utterances never encountered before. The language we have actually encountered is often faulty, but more importantly is only a limited set of examples of particular language use. Thus, experience and reinforcement cannot account for the ability to understand and produce novel utterances. How then, can this creative ability that all competent language users possess be picked up or learned on the basis of limited experience? Chomsky's solution to this problem is to propose that human language is possible because we possess a special intellectual ability, namely an innate universal grammar which contains generative as well as transformative rules, that is, it is itself creative. We all speak different languages, but our ability to speak as the people around us is grounded in a grammar which is inherent in the human mind and the same for every one. The rules of this grammar enable us to construct the grammar of our native language and also to understand and produce new meaningful sentences because the rules can be used in a recursive way. This universal grammar has to be innate because it can never be picked up from the limited and often faulty experience we have of language. The language the child hears as it learns to speak cannot be utilized unless the child already has innate grammatical hypotheses with which the child can interpret and analyze the

heard language, and thereby gains access to the rules governing a natural language. Nothing new is really learned, but experience triggers what is already inherent in the mind. Speaking creatively is only a reflection or expression of a creative intellectual ability inherent in our minds. Thus, the behavioristic claim that anything can be learned (and that all intellectual abilities are learned) is turned into its opposite—one can only learn what one already knows, so there is really no such thing as learning. Chomsky's solution to the problems of learning has been taken up and developed by J. Fodor in his theories of a computational language of thought underlying all learning.[26] He has developed and made explicit a theory of learning inspired by Chomsky and henceforth I will focus on his theory. Fodor agrees with Plato and Chomsky that there really is no learning because the acquisition of new knowledge requires that we already know what we are learning.[27] His conception of a computational language of thought with recursive rules is, though, an improvement over Plato's and similar theories, because the innate framework, the language of thought, is itself productive, enabling the learner to go beyond the information given in the language of thought. The language of thought is productive but it also functions as a limiting framework. The child uses the language of thought to form and test hypotheses about language use in its linguistic community. Just as Skinner's reinforcement schedules limit and guide what the child learns from experience, so does the innate language of thought.

What makes Fodor's theory particularly interesting is that he has attempted to characterize the structure and functioning of the innate productive language in terms of recent ideas of the mind as a computer program. That is, he is not just as Chomsky describing the innate linguistic rules but sets forth a theory or mechanism of how the mind actually work, that is, he provides us with an empirical theory of learning, not only of language, but in general.

THE PROBLEM OF THE MEANINGFULNESS OF THE FRAMEWORK: WITTGENSTEIN

The same problem that Chomsky saw in syntax was seen by the philosopher Ludwig Wittgenstein, later in his life, in semantics:

how can our language be rule governed and productive at the same time?[28] How can the meaning be governed by specific and determinate rules and yet apply to new instances of what the word refers to? His discussion of this problem in terms of family resemblance (to illustrate productivity) and skill, technique or custom (to illustrate problems with rule following) is radically different from Chomsky's and Fodor's account, and was developed as a critical reaction to a Chomsky/Fodor-like conception of language. Wittgenstein tried to show that the questions this kind of approach asks are misconceived, but his discussion addresses the same fundamental problem because for him, as for Chomsky, language is inherently productive, yet determinate. But neither this nor the fact that children learn to speak productively and meaningfully needs to be explained in terms of an innate rational ability. Indeed Wittgenstein thought such explanations or accounts were empty or circular—they presuppose what they set out to explain. Hence Wittgenstein shows that the problem of productivity, or the problem of induction, arises not only in the context of connecting old knowledge with new knowledge as in the case of understanding a sentence never encountered before, but also in connecting one's representations with the world. How can the child master certain semantic rules? And how is the child able to apply them to new situations? Learning a language is going beyond information in two senses; to go beyond signs to what they represent and to go beyond past uses to new uses.

But the problem of the framework arises here as well. The issue here is best illustrated by considering language learning. In learning a language the child has to master semantic rules. In order to learn how words are connected with nonlinguistic items or events, the child, according to the paradox of Meno, either already knows the semantic relationship or does not. In the first case no learning is necessary and in the second learning is impossible. Neither overhearing language nor getting the semantic relationship explained can help the child learn unless it already knows what it is.

> one cannot meaningfully and significantly say in a language what these meaning relations are, for in any attempt to do so one must already presuppose them.[29]

This is one of the main problems that Wittgenstein tries to illuminate in his later writings.

So the problems of productivity and of the framework appear twice or on two different levels in accounts of learning, on the level of transformation of knowledge and on the semantic level. They also reappear on the level of communication, of going beyond one's own private language and interacting with others.

COMMUNICATION

Language involves not only describing the world but also communicating with fellow speakers. The child has to learn to communicate and make sense to other speakers and here we encounter again the two problems of learning: productivity contra a limiting framework. Communicating requires something beyond the speaker's subjective, private mental state, namely an objective and intersubjective framework, which the speakers share. Two speakers do not only have to share the same framework, but there has to be something outside each private mental sphere which backs it up or insures that they mean more or less the same thing. In this sense the language learning child has to move from its own private experience to something beyond. The framework (socio-linguistic conventions) is itself limited yet allows the speaker to create new conventions of linguistic use. Does this mean that the child has to know the socio-linguistic conventions in order to communicate, and hence cannot learn them? If this is the case we are faced with the problem of productivity again: how can the child cope with new situations?

I will attempt to answer all these related questions, by critically discussing both Fodor's and Wittgenstein's contributions to our understanding of learning, specifically language learning. I will argue that although they both have increased our understanding of what a theory of learning has to involve, they both fall short of providing such a theory. Fodor's theory of an innate language of thought does not explain what it attempts to explain. Wittgenstein never attempted to develop a theory of learning or productivity but to clear the way for such a theory by exposing conceptual confusion. His criticism and scattered remarks on learning can, though, be taken as the basis for a model of learning. This model uses his basic conceptual clarifications and adds empirical and theoretical developments in contemporary psychology, biology, and neurophysiology to it. The

critical discussion of Fodor and Wittgenstein will, thus, function both as a "tool" to lay bare the conceptual or logical problems involved in understanding learning and as a source for a new way of looking at old facts.

THE DOMESTICATION MODEL OF LEARNING AND PRODUCTIVITY

This model is an attempt to show that it is possible to reconcile or make a trade off between productivity and a framework for learning. The model I would like to propose is, as was just mentioned, a development of the later Wittgenstein's approach, and takes as evident that (1) language like skills (e.g., they, like language, entail representations of the environment) are required as a staring point for learning language and acquiring conceptual thought. (2) Actual language heard or conceptual experience is limited and (3) language and concepts are learned and used in a communicative context. Both the starting point of learning (a set of skills and behaviors) and the context in which learning takes place function to limit what can be learned. They impose limits and structure on language and thought which are inherently underdetermined; that is, open to different interpretations and use, and therefore also inherently productive.

I suggest that we can begin to understand the learning of language and begin developing a tenable theory, if we use the lessons learned from Chomsky, Fodor, and Wittgenstein. Such a theory has to take into account that experience is limited and that language itself is productive, and recognize that human beings are limited creatures.

The Domestication Model of learning, which I am proposing, presupposes Wittgenstein's account of productivity, that is, a version of finitism.[30] Language and thought are seen as inherently underdetermined and open-ended, and can be developed or used in an indefinite number of ways. This poses two problems for a theory of learning, namely how can the underdetermined experience be limited and how are communication, objectivity, and constancy in meaning acquired? I agree with Wittgenstein that it is not necessary to assume an innate language of thought, but that the limiting framework is found in the child's natural behaviors and, equally important, social interactions. Furthermore I

claim that the "learning mechanism" is not a rational process based on the language of thought, but a process of training based on certain similarities between innate nonrational skills and behaviors.[31]

The Domestication Model of learning sees the newborn infant as a purely natural or biological being which possesses specific behaviors or skills, but lacks typically human features like language. The behaviors can be called skills, because they are structured in order to accomplish specific tasks, for example, sucking or grasping. The skills have an innate basis, but develop to become functional as a result of experience. These and other skills, although not entailing explicit knowledge or language, nevertheless are language-like. For example orofacial movements like chewing a piece of bread is a sequence of steps and sub-steps which must be executed in a specific way and order. The same holds for the utterance of a sentence. Because of this similarity they can be the basis of, or rather the ingredients in, the mastery of language (e.g., syntactic speech). The child can incorporate these changing skills into the demands or restrictions set by the socio-linguistic environment. In this way something individual, when combined or structured by the social environment, emerges as something public and shared by others.

The Domestication Model of learning, thus, splits the framework into two components—on the one hand we have the innate and individual specific behaviors and skills, and on the other the external and public socio-linguistic environment. The socio-linguistic environment provides both language heard in a specific social context and the mechanisms to limit the interpretation or generalizations which are socially acceptable. The individual contributes the behavior or skills which are shaped and changed by this experience. Although the individual contributions are necessary for learning, the way they develop and eventually come to be replaced by social characteristics are not predetermined but depend on the extra-individual aspects of the framework. In this sense learning a language is a negotiated social construction.

This approach shares the view of innate theories that something like that which is to be learned has to be innate, but does not take the innate to be a language of thought. Instead it takes specific behaviors and skills to be part of the framework and in these respects is similar to Piaget. The Domestication Model sees,

just like Piaget, the skills as structured and not as random behavior as the behaviorists like Skinner assumed. It differs, though, from Piaget in that the acquisition of language is not based on the acquisition of thought, nor is it the result of interaction between the individual and its physical environment, but necessarily involves the social environment as well. Furthermore, language is not seen as only a continuation of mental constructions following a set pattern. In stressing the importance of other people in learning language it is similar to behaviorism, but due to finitism (i.e., the idea that language is underdetermined or that future uses of language are not determined by previously established habits of language use) it escapes the failure of behaviorism to account for productivity. The Domestication Model owes much to such philosophers as the later Wittgenstein, Harré, Hattiangadi; psychologists like Vygotsky and Bruner; and draws from areas such as neurophysiology and evolutionary biology.[32]

The Domestication Model sees the learning of language as a result of the combination and interaction of different skills in the context of increasingly complex social interaction. Much is given to the child, like innate structures of perceptual organs and reactions, ways of manipulating objects, and just as important examples of language, correction, and help by adults. The child is able to transcend this and go beyond what is given. The Domestication Model divides the relevant skills into two groups: (1) linguistic skills and (2) communicative-semantic skills. Linguistic skills involve such things as speech perception and speech production. Both of these have an innate foundation but are modified in interaction with a linguistic community. Linguistic skills also involve syntactic skills, which, it is argued, are based in different motor skills. Lieberman (1985) suggested, for example, that behaviors like chewing or swallowing are the basis of sentence construction. Psychologists of Piaget's school also operate with a similar hypothesis.[33] The communicate-semantic skills consist, as the name indicates, of semantic skills which are developed in the context of imitation and play. Both these skills involve symbolism and the ability to relate to something not immediately present to the mind. For example, the child plays with a stick as a horse, and can imitate behaviors like the closing of the eyes which are appropriate to another situations like going to sleep. Social skills also develop in play such as "Peekaboo,"

but are also important in the close interaction between the child and its care giver. These two often function in a symbiotic relationship, where the adult complements the child and ascribes to the child desires and beliefs on the basis of which the child is treated in specific ways.

A presupposition for all this is an undeveloped and flexible brain, cross-model transfer of skills (e.g., orafacial to speech), and a long childhood. Many of the skills involved in language are found in other species as well, but it is only their unique combination that is found in man. This approach to language acquisition in the individual can be applied to the problem of the evolution of language, since it sees language learning as a case of biological flexibility or redundancy of biological functions. As already Darwin pointed out in the *Origin of Species*, one and the same biological structure can perform many different functions and two different organs can perform the same function, thus enabling the emergence of new structures and functions. In the purely biological as well as in the linguistic world it is possible to go beyond structures and information given.

SUMMARY OF THE BOOK

In what follows I focus my critical discussion on Fodor's and Wittgenstein's solutions to the problems of productivity and learning. Their approaches are paradigmatic in that one (Fodor) represents a revival of of some of Plato's ideas and the other (Wittgenstein) is closer to empiricist accounts of learning.[34] In addition to having carefully argued approaches to the issues discussed above, their approaches can also be seen as representative of the two main, and conflicting, theoretical approaches taken in psychology. Ideas like Fodor's have been influential not only for theories in linguistics but also in cognitive science, especially in the area of Artificial Intelligence. Wittgenstein-like ideas are found in Vygotsky and explicitly in J. Bruner's work. Piaget,[35] perhaps the most influential of developmental psychologists in this century, developed a theory of cognitive growth which in many aspects is an attempt to bridge the gap between empiricists and rationalists. The Domestication Model of learning owes some things to Piaget (especially his empirical studies), but takes his approach to be lacking in an important respect, namely in not

making social interaction an integral part of any learning process. Learning is not individual construction, it is social construction.

The problem of learning has both a philosophical and an empirical side to it. Without a clear understanding of what learning involves, of which conceptual and meta-theoretical problems have to be solved, empirical data are difficult to make sense of and use in giving a coherent picture of learning. But meta-theoretical and conceptual clarifications are only the first and incomplete steps. Such considerations are the focus of the first part of this book, where I discuss Fodor's and the later Wittgenstein's arguments in detail. Here Fodor's theory is rejected in favor of a reconstruction of a Wittgensteinian account of learning. The second part consists of an attempt to develop an empirical theory based on the conclusions from the theoretical discussion. The Domestication Model of learning can, since it is a development of some of Wittgenstein's remarks, be seen as a test of his ideas. Also, do these ideas provide a better alternative to the theory Fodor suggests?

Fodor, as mentioned, relies on Chomsky, but has generalized and developed Chomsky's ideas on learning in his theory of an innate language of thought. In chapter 2, I present Fodor's conception of mind focusing on his conception of the language of thought. This view entails that an individual's cognitive performance and learning can be accounted for in terms of the deductive relations that hold between propositions the learner already knows, and that one can not learn a conceptual system richer than the conceptual system one already has. In chapter 3, I discuss the shortcomings of Fodor's theory, arguing that his hypothesis of an innate language of thought does not explain what it sets out to explain, cannot be empirically tested, and, even if this criticism is disregarded and one takes the hypothesis as empirically testable, it clashes with a better established theory, namely the theory of evolution.

This is followed up in chapter 4, where I present the later Wittgenstein's criticism of his own earlier views, which I interpret as a criticism of Fodor-type theories. In chapters 5 and 6, I reconstruct a Wittgensteinian account of learning showing that it is more viable than Fodor's, hence arguing that a theory of learning resolving the dilemma of the framework and productivity is possible.