



# How We Learn

Learning and non-learning in school and beyond

Knud Illeris

SECOND EDITION



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# How We Learn

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Having published in 11 languages and sold more than 100,000 copies, this fully revised edition of *How We Learn* examines what learning actually is and why and how learning and non-learning take place. Focusing exclusively on learning itself, it provides a comprehensive yet accessible introduction to traditional learning theory and the newest international contributions, while at the same time presenting an innovative and holistic understanding of learning.

Comprising insightful and topical discussions covering all learning types, learning situations and environments, this edition includes key updates to sections on:

- the basic dimensions and types of learning
- what happens when intended learning does not take place
- school- and education-based learning
- reflexivity and biographicity
- the connections between learning and personal development
- learning in the competition state.

*How We Learn* spans from a basic grounding of the fundamental structure and dimensions of learning and different learning types, to a detailed exploration of the differing situations and environments in which learning takes place. These include learning in different life stages, learning in the late modern competition society and the crucial topic of learning barriers. Transformative learning, identity, the concept of competencies, workplace learning, non-learning and the interaction between learning and the educational approaches of the competition state are also examined.

Forming the broadest basic reader on the topic of human learning, this revised edition is integral reading for all those who deal with learning and teaching in practice. Particularly interested will be MA and doctoral students of education as well as university- and school-based teachers.

**Knud Illeris** is a Danish professor of lifelong learning and the founder of the Simonsen & Illeris Educational Consultancy. He has studied learning in theory and practice for more than 40 years and lectured in 35 countries in all parts of the world. He has also been an honorary professor at Columbia University in New York and is a member of The International Adult Education Hall of Fame.

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## Learning and non-learning in school and beyond

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Knud Illeris

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# Foreword

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Writing this book has been both hard work and a great pleasure. Quite special conditions prevail when one wishes to communicate the essence of almost 40 years' work as a researcher, theoretician, writer and debater in the field of learning and education while simultaneously striving towards a product with broad appeal, that can be used and is challenging. My ambition has been to write a book that covers the field as widely as possible today in relation to the subject of learning, is up to date with the most recent developments in the area, and can be read and used by a circle of readers that range from students and future teachers at all levels to professionals in the fields of psychology, pedagogy and a broad range of education programmes.

More specifically this work may be seen as a rewriting of my book *The Three Dimensions of Learning*, published in Danish in 1999 and in English in 2002. But at the same time it includes a number of new topics and has a new and more distinct structure. For me personally, the 'old' book was a kind of voyage of discovery where I tried to make sense of a field that was large and complex. When I started on my journey, I had no idea of what I would find. This book, on the other hand, after a number of further studies and numerous discussions with many people in many countries is, rather, an attempt to pass on the essence of what I have now discovered and realised in a well-structured, clear, comprehensible and engaged form.

The book is thus, on the one hand, a type of textbook that examines all the sub-elements of significant interest for understanding what learning is and why and how learning and non-learning take place. On the other hand, it is a piece of scholarly work because it not only draws on texts in the field that are already available, but adds new material, new understandings and new points of view. But, first and foremost, it presents the subject on the basis of a certain general understanding, producing a whole that has not previously been presented and which is significantly more wide-ranging, more comprehensive and more varied than the draft presented in the first version. Approximately a quarter of the book comprises thoroughly revised sections of the 'old' book, a second quarter presents fresh examinations of topics that also formed part of this book, and about half of the text deals with completely new issues and contributions that I believe it important to include in order to give an adequate treatment.

I am very grateful to all the many students, teachers, researchers and others with whom I have been in contact during meetings, discussions and lectures, by email, letter and phone concerning all possible subjects relating to learning, and naturally also to my colleagues at Roskilde University, at Learning Lab Denmark (LLD) and at the Danish University of Education. There are also many to whom I owe a special thanks.

First, Hans Siggaard Jensen, Director of LLD, who ensured that I had working conditions that have made it possible to write the book during 2005 and the beginning of 2006, and in this connection also Henrik Nitschke from LLD and Thomas Bestle from Roskilde University Press, who have enthusiastically involved themselves in the production and launching of the book.

Special thanks go to three teachers: Sanne Hansen from Zahle's College of Education, Gunnar Green from Blaagaard Teacher Training College, and Palle Bendsen of the Copenhagen Day and Evening College of Teacher Training, all of whom read the manuscript and made important comments, and to my colleagues Steen Høyrup and Bente Elkjær, who have given me valuable critique during our cooperation at LLD. Mia Herskind and Christian Gerlach from LLD have assisted me with the sections on corporality and brain research, respectively, and Per Fibæk Laursen from the Danish University of Education has provided me with tips for the section on intelligence. I also received important inspiration from Mads Hermansen, Copenhagen Business School, and Jens Berthelsen, University of Copenhagen.

The many international researchers and theoreticians with whom I have discussed learning over the years have been a very important source of support and inspiration. The most important have been Peter Allheit (Göttingen), Ari Antikainen (Joensuu), Chris Argyris (Harvard), Stephen Billett (Brisbane), David Boud (Sydney), Ralph Brockett (Tennessee), Stephen Brookfield (Minneapolis), Per-Erik Ellström (Linköping), Yrjö Engeström (Helsinki), Phil Hodgkinson (Leeds), Peter Jarvis (Surrey), Michael Law (Hamilton, NZ), Thomas Leithäuser (Bremen), Victoria Marsick (New York), Sheran Merriam (Georgia), Jack Mezirow (New York), Wim Nijhof (Twente), Kjell Rubenson (Vancouver), Joyce Stalker (Hamilton, NZ), Robin Usher (Melbourne), Ruud van der Veen (New York), Susan Weil (Bristol), Etienne Wenger (California), Danny Wildemeersch (Leuven) and Lyle Yorks (New York). Most of them figure in the reference section of the book.

Finally, a very special thanks to my partner Birgitte Simonsen with whom I have worked for almost 30 years and with whom I have been able to discuss all possible academic subjects and questions, and who has, of course, read this book and made very important comments.

Finally, a couple of practical comments. As a scholarly work, the book has many more, especially Danish, references than I have found it appropriate to include in the English edition. A complete literature list can, however, be found at the website of Roskilde University Press: [www.ruforlag.dk/laering](http://www.ruforlag.dk/laering).

Where there are references to persons who are deceased, as far as possible I have given the dates of birth and death on the first occasion the person is mentioned.

Direct translations of quotes to English have been taken from existing works where this was possible. The book was translated by Margaret Malone with whom I have enjoyed close cooperation for many years and whom I also thank for her great and dedicated efforts.

I hope my readers will enjoy reading the book and that they will come away enriched.

Knud Illeris  
January 2007

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# Foreword to the second edition

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Since the first edition of this book was published in English in 2007 many things have happened in relation to the book itself, and to the connections and contexts to which it refers.

As for the book itself, it has been or is being translated into several languages (Swedish, Norwegian, Faroese, German, Polish, Greek, Chinese, Korean, Iranian), and in 2009 I published an edited book, *Contemporary Theories of Learning*, which includes shorter versions of my own and 15 other theoretical understandings of learning and has been translated into Greek, Romanian, Portuguese/Brazilian and Korean. Together with articles in Finnish, Icelandic, Lithuanian, Dutch, Italian, Slovenian and presentations in 35 countries in all parts of the world, this means that my theoretical approach to learning is today probably the most widespread, and it also has the broadest coverage, especially because it includes what is at stake when intended learning does not come through or is distorted, defective or insufficient.

At the same time the landscape of learning and teaching efforts has changed significantly, especially by the strong extension of neoliberal ideas about management, measurement and effectivity, and the dominance of the so-called competition state as a governing ideal. Among a lot of other changes in understandings, ideals and management of modern societies, this has meant that schooling and education have been dealt with from an angle of effectivity and economy, almost as a matter of industrial production, while the insight into how human learning and non-learning take place has been marginalised and biased.

As a consequence of this, I have experienced a growing need for a new and updated edition of this book, which maintains its general approach and understanding of learning and non-learning and at the same time makes allowance for the mentioned changes and their influence on learning situations and possibilities both inside and outside schools and other educational institutions and environments. As such, I have on the whole maintained the structure of the book (so that it is possible to use the first and the second edition together in classes and projects), and the majority of the text has remained unchanged, although many new references have been included instead of or in addition to the original references. Major changes have mainly been made in areas, which in the meantime

have been subject to alterations, e.g. because of the mentioned neoliberal ideas, or issues which I have taken up because they have become more important or influential. This includes such concepts as competencies, transformative learning, identity and identity development, and not least the extensive changes of the institutional conditions of the school and educational systems at all levels as a consequence of the ideas of the competition state. In this last-mentioned context I have received considerable inspiration and insight from the contributors to my Danish edited book, *Learning in the Competition State* (2014): Peter Østergaard Andersen, Steen Hildebrandt, Katrin Hjort, Noemi Katznelson, Søren Langager, Ove Kaj Pedersen, Nadja Prætorius, Birgitte Simonsen, Etienne Wenger and Thomas Ziehe.

It is my hope that the new edition of the book will remain a relevant, inspiring and thought-provoking contribution to learning for many years.

Knud Illeris  
July 2016

# Introduction

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This brief introductory chapter discusses the nature of learning and provides a definition of the concept as employed in the present book on the basis of an outlined example. This is followed by an overview of the structure of the book.

### 1.1 What is learning?

Over millions of years human beings have developed fabulous abilities to acquire possibilities of understanding and acting, which by far surpass what other species are able to – it is not too much to say that *humans are created as learners*. But we are at the same time also *doomed to be learners*, we have no possibility to avoid learning, although we do not always learn exactly what we ourselves or others have intended. In contemporary societies we are also *enforced to be learners*. In nearly all countries there is compulsory school attendance, and in addition to this there is a lot that we all have to acquire in order to be able to function in daily life and various specific contexts. It is to a great extent this direct as well as indirect enforcement that in various connections can make learning problematic. We cannot restrict ourselves to learn what we like or meet by chance. Learning is both an individual and a societal matter.

The first reaction of most people to the term *learning* is something to do with going to school. Basically, school is the institution established by society to ensure that all members of that society acquire the learning necessary for its maintenance and continuation. All normal young people and adults have spent more than 10,000 hours of their lives at school; some have spent much more (Rutter *et al.* 1979). This has, of course, decisively and radically influenced our growing up.

The learning situation that most people typically recall is ordinary class teaching. Let me take an example.

We enter a mathematics lesson at a school. The children are learning to divide. The teacher is standing at the blackboard explaining how to do it. She writes a typical division sum on the board and demonstrates how to solve it. Or the form of teaching may be more group oriented. In this case, the children sit in groups and help one another to work out the problem, or call on the teacher if they need help.



In both cases most of the children participate in the activities as expected. They understand what it is all about and memorise the method. They might understand it immediately, or they might have to have it shown to them several times before they have really grasped it.

But there are also some pupils who have problems with this and some who find it hard to concentrate. They might feel that what they have to learn is abstract or boring or they have difficulty seeing what they can use it for. They think of other things that preoccupy them to a greater extent or are more meaningful for them. There can also be those who find it difficult to understand even though they try to follow. They might not have learned to multiply properly and, therefore, cannot understand division. Or they have a bigger problem with numeracy, which requires special treatment.

It is, after all, an ordinary experience from school that not everyone learns what is expected and some pupils forget some of it very quickly. Even though most children learn a lot at school and everyone learns something, there is no automatic link between teaching and learning. Later, when the class goes on to percentages, for example, there are more pupils who find it difficult, and even more difficult when they reach differential and integral mathematics.

What happens is that the pupils who are good at school build up their self-confidence and often also their desire to learn more, while those who find it difficult learn that they are not so good at school learning. For a significant number of children, an important part of what they learn at school is that they are bad at arithmetic and mathematics.

On the other hand, one also learns a great deal outside of school. Children have already learned a whole lot of fundamental things before they ever go to school (e.g. to speak one or more languages), and they know a great deal about the social contexts they are part of. And when they are of school age, they also learn a great amount outside of school hours through play and other activities. We all learn something throughout our whole lives. But part of what we learn can be wrong or take the nature of defence or blockings, or how to avoid defeats and uncomfortable situations.

These few brief examples and reflections should be sufficient to demonstrate that learning can be many and very different processes. Learning can appear positive or negative in nature, but for the individual it always has some purpose or other that has to do with managing life and its challenges. It is, thus, an extensive and very complex field that I will attempt to capture, analyse, describe and systematise in this book, at the same time as maintaining the field's complexity rather than trying to reduce it, as has, for example, previously been the aim when learning theoreticians have attempted to find a fundamental learning form or learning process (for example, Madsen 1966, pp. 64, 75, 95).

### **1.2 A definition of learning**

The term learning is used very broadly and also with different meanings. Very generally, four different main meanings can be distinguished that most frequently

occur when the term learning is used in a non-specific manner in everyday language:

- 1 First, the term learning can refer to the *outcomes of the learning processes* that take place in the individual. Learning, here, is used to mean what has been learned or the change that has taken place.
- 2 Second, the term learning can refer to the *mental processes* that take place in the individual and can lead to such changes or outcomes as covered by meaning one. These may be termed learning processes, and it is typically these processes that learning psychology is concerned with.
- 3 Third, the term learning can refer to both the *interaction processes* between individuals and their material and social environment, which, directly or indirectly, are preconditions for the inner learning processes covered by meaning two (and which can lead to the learning covered by meaning one).
- 4 Finally, the term learning is very often employed not only in everyday language, but also in official and professional contexts, more or less *synonymously with the term teaching*. This shows that there is a general tendency to confuse the terms for teaching and learning.

While meaning 4 is obviously inappropriate, the first three meanings all have significance and justification. But it can often be difficult to see which meaning is being referred to, and sometimes these matters can only be separated analytically and not in practice. To overcome these uncertainties, I will therefore define learning broadly as *any process that in living organisms leads to permanent capacity change and which is not solely due to biological maturation or ageing*.

My definition is deliberately very broad and open. Expressions such as ‘any process’, ‘living organisms’ and ‘permanent capacity change’ have been chosen to avoid introducing unnecessary limitations. What is crucial is that learning implies a change that is permanent to some extent or other, for example, until it is overlaid by new learning, or is gradually forgotten because the organism no longer uses it. It is also crucial that the change is not just a matter of maturation of potentials that are present in the organism in advance, even though such maturation might very well be a prerequisite for learning taking place.

The term ‘organism’ has been selected because it is not just human beings that can learn something, and many studies of animals have been of significance for understanding learning. However, in this book it is human learning that is at the centre, and the learning of other organisms is included only where it is relevant for the understanding of human learning.

It is also important to be aware that the chosen definition implies that a number of processes termed in words such as socialisation, qualification, competence development and therapy, come under the chosen learning concept and are regarded as special types of learning processes or as special angles for perceiving learning. The term development is understood as an umbrella term for learning and maturation, and I thus regard the ‘classical’ conflict in psychology concerning

whether learning comes before development or vice versa (see Vygotsky 1986 [1934], pp. 260ff.) to be mistaken. Learning is part of development.

In my opinion it is extremely important to work with such a broad, open-learning understanding, in principle because it is impossible to maintain the borders between what learning is and what, for example, socialisation or therapy is, and in practice because it is only when all the elements have entered the picture that it is possible to discern important connections and patterns of interaction.

Finally, it should be pointed out that the definition also implies limitations and distortions that can, in turn, imply quantitative and/or qualitative restrictions in what is learned also being regarded as something one learns, for example, if the volume or nature of learning options becomes unmanageable or threatening.

### **1.3 The structure of the book**

The theory or framework understanding of learning developed in this book falls into four parts.

The first part consists of this introductory chapter and the next chapter, which deal with the basis of the understanding of learning by connecting a number of different contributions drawn from psychology, biology, brain physiology and social science.

This is followed by the book's second and central section, which has to do with the structure and nature of learning. Chapter 3 sets up a model covering the two processes and three dimensions of learning: the content dimension, the incentive dimension and the interaction dimension, and in Chapter 4 a typology covering the four fundamental types of learning is elaborated. A further number of matters concerning learning are examined in Chapters 5, 6 and 7 on the basis of each of the three dimensions, and an overview of the most important matters of significance for learning as a whole are presented in Chapter 8.

The third part, consisting of Chapter 9 alone, is about the most important types of barriers to learning that exist today, i.e. what happens when intended learning does not occur or the learning takes a different course from what has been intended. These matters are only rarely dealt with in contributions on learning theory, but here they are regarded as just as important as the discussion concerning more, or less, successful learning.

The focus in the fourth part of the book is on a number of areas comprising some of the most important of the many different conditions influencing the nature, course and outcome of learning. In Chapter 10 this concerns the learner's different types of preconditions, including dispositions, abilities and intelligence, learning style, gender and social background. Chapter 11 deals with learning through the life course and at the different life ages. In Chapter 12 learning is viewed in relation to the most important practice fields or learning spaces: everyday learning, school learning, learning in working life, net-based learning and learning in activities that interest the learner. In Chapter 13 the subject is learning in connection with different types of pedagogical organisation

and political conditions. Finally, Chapter 14 sums up the main points of the framework developed and places the many different contributions and authors who have been discussed in relation to the learning model.

## **1.4 Summary**

The most important matters in this introductory chapter can be summarised through the idea that learning is a very complex and many-sided matter including ‘any process that in living organisms leads to permanent capacity change and which is not solely due to biological maturation or ageing’. This definition implies that processes such as socialisation, qualification, competence development and therapy are regarded as special types of learning processes or special angles from which learning is viewed. The definition also implies that limitations and other matters that can mean a narrowing or distortion of what is learned are also regarded as something one learns. The concept of ‘development’ is understood as an umbrella term for learning and biological maturation.

Moreover, the chapter includes a structuring of the topic of learning and of this book in four main areas: first, an understanding of the basis of learning; second, an understanding of the structure of learning, including three dimensions and four fundamental learning types; third, an understanding of the barriers that can lead to intended learning not taking place; and fourth, that learning is influenced by a number of different conditions of an individual, social and societal nature.

# The basis of the understanding of learning

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Chapter 2 deals with the different matters forming the basis of the understanding of learning in this book. These are the basic psychological, biological, brain and sociological conditions of learning. It is emphasised that all these areas and their interaction must be involved in a comprehensive understanding of learning.

### 2.1 The various sources of the understanding of learning

The broad understanding and definition of learning outlined in Chapter 1 means that many different sources must be taken into consideration if the whole complexity of human learning is to be understood.

Learning has traditionally been understood first and foremost as a psychological matter, and learning psychology is one of the most classical disciplines of psychology. But other psychological disciplines must also be involved, such as developmental psychology, cognitive psychology, personality psychology and social psychology. In relation to educational psychology it is important to maintain that learning psychology deals with what happens with the learner, whereas educational psychology is about what others can do to promote or influence the learning process and especially the organisation of teaching and education. In practice there is, however, a considerable overlap, which mainly means that good educational psychology of necessity must relate to learning psychological insight with special reference to educational organisation. On the other hand, learning psychology must often relate to which kind of learning various influences and kinds of teaching can contribute to, but this does not directly involve the basic structures which are the core area.

In recent years, however, understanding of learning has also been taken up to a considerable extent quite outside of what we traditionally understand as psychology. This has taken place, on the one hand, on a biological basis in connection with understanding the various functions of the body, and especially during the later decades learning has become a central topic of advanced brain research. On the other hand, on a social science basis, first and foremost in the grey area between sociology and social psychology, but also socially more broadly and right into national economy, this applies, for example, to measures to strengthen the learning in certain groups and occupations with a view to economic growth and competitiveness.

In addition, within both psychology and the areas mentioned there exist different fundamental views or 'schools' that perceive the basis of learning differently. For many years, from around the beginning of the twentieth century and up to the 1980s, behaviourist psychology was dominant in research on learning, in the United States especially. But in Europe in particular there have also been many other competing basic views such as Gestalt psychology, the constructivist and the cultural historical. In the United States in the 1950s and 1960s humanistic psychology, especially, appeared as an alternative, and the Freudian or psychoanalytical view also implies a special understanding of learning. In so-called critical theory or the 'Frankfurt School' this latter psychoanalytical approach is combined with a Marxist-oriented perception of society.

I will return to this many times later in the book. What is important here is to point out that it is a fundamental view in the book that each of these academic fields and schools can have something important to contribute to a satisfactory holistic understanding. From the point of view of theory of science, a crosscutting approach such as this has often been regarded as extremely negative and suspicious, not least within psychology with its many competing schools. It has derogatorily been labelled 'eclectic', i.e. incoherent or with no clear, well-defined foundation.

However, it has always been a fundamental point of departure for me that it is impossible to arrive at an adequate understanding of the extensive and complex field of learning without relating to the results achieved in so many scholarly approaches. A great deal of energy has been wasted in the field of psychology on the different schools waging war with one another instead of working together and trying to find points of contact.

But the prerequisite for working consistently on such a basis is that a general frame can be set up as a starting point in relation to which the various contributions can be viewed, so that a coherent and well-defined foundation is, nonetheless, present to be built on. I attempt to construct such a frame in Chapter 3, and on this basis a great number of different contributions will be included, assessed and processed. In fact, the work on which this book builds is, to a high degree, in the nature of an examination of a great number of different understandings of learning which, taken together, have proved able to fill out a common frame of understanding which has been clarified and refined on the basis of the impact of the different contributions (see also Illeris 2002).

Before I turn to sketching this frame, however, in the rest of this chapter I will outline the main lines about the grounding of the understanding of learning in the psychological, the biological, the brain physiological and the sociological angles of approach, respectively.

## **2.2 Learning and psychology**

Traditionally, psychology is first and foremost the science of human behaviour in the broadest sense. The behaviourist school has, in principle, limited itself to

behaviour that can be registered directly but, nonetheless, learning psychology has, as mentioned, been a key discipline in behaviourist psychology even though learning processes are not immediately observable. What can be observed is a part of the results of the learning processes – for example, that a child can manage a certain division sum.

But can one then conclude that the child has, in general, also understood what division is and the contexts in which it is relevant to concern oneself with division? And what about the child's emotions in this connection? The child might express joy or satisfaction if the sum is correct. But how are joy and satisfaction to be measured, how do such emotions influence learning, and how can we know whether these emotions are due only to the correct sum, or are other matters also involved? And what is the subjective value and application value of what is learned? Is the child going to remember what he or she has learned and will it be used outside of school?

Happily, other psychological schools go much further than immediately observable behaviour, and in general psychology can, perhaps, best be characterised as a science of experience. It has to do with description, systematisation and explanation of our experience of what people do and say and think etc. in all possible situations and contexts, both in everyday life and in special situations, and it also includes observations of animals in various situations. The volume of data available is thus limitless, because there seems to be no limit to what people can try to learn.

Nevertheless, there are some fundamental matters to which one always must relate when working with learning or other psychological issues. First, the human being is a biological creature born with certain specific possibilities and limitations. While there are considerable individual variations, there is also a great deal that we have in common, and there are matters that lie completely outside of our scope. For example, we cannot learn to run as fast as a panther, there are sound waves we cannot hear, etc. In other words we are limited by what our bodies and brains can achieve.

The second fundamental matter is that we live in a physical and social environment. We have to enter into interaction with this environment, we can play a part in influencing and changing it, but we cannot place ourselves outside of it. Even if one tries to completely isolate oneself, one will be influenced by the fact that that is what one is doing.

For these reasons psychology is also, by necessity, a science of how human beings in all dimensions relate, and can relate, within and in relation to the possibilities and limitations set by the organism and the environment. Understanding learning must, naturally, also relate to these existential conditions.

### **2.3 Learning, biology and the body**

When learning is studied as a psychological phenomenon, the body can easily seem to be a sort of case that is only included if what is to be learned is wholly or

partly bodily in nature, for example, when one is learning to walk, swim or cycle. Learning is primarily understood as a mental affair, and the bodily aspect is only included in special cases.

But, in fact, almost the opposite is the case. Like other mental processes, learning is something that is based in the body, and what we call mental is something that has emerged together with the development of human beings and their predecessors over millions of years. Primitive creatures can also learn, but we do not attribute any psychic or mental life to them.

In human beings, learning primarily takes place through the brain and the central nervous system, which are specialised parts of the body, and if one wishes to approach an understanding of the way in which our learning potential has developed and functions, one must go beyond the division between body and psyche, between the bodily and the mental, which has been so central in the understanding of the Western world for centuries.

The French philosopher, René Descartes (1596–1660), who formulated the famous precept ‘I think therefore I am’ (‘Cogito, ergo sum’) already in the seventeenth century (Descartes 1967 [1637]), is often mentioned as the classical example of this Western understanding. The precise meaning of this sentence has subsequently been the subject of much discussion: for example, the well-known Norwegian historian of philosophy Arne Næss (1912–2009) was of the opinion that the translation from Latin should, rather, be ‘I experience’ or ‘I am somewhat aware’ rather than ‘I think’ (Næss 1963 [1962], p. 143). But what is crucial in this connection is that Descartes refers to the mental aspect as what is central to human existence, raised above the physical and the emotional, and it has precisely been such a fundamental understanding that has been dominant in the Western world.

Charles Darwin’s (1809–1892) theory about man’s descent in *Origin of Species* (Darwin 1958 [1859]) created the basis for another approach, and, at the end of the nineteenth century, William James (1842–1910) and Sigmund Freud (1856–1939), two of the greatest pioneers of scientific psychology, took their point of departure in the bodily embedding of the psychological in the final analysis (James 1890; Freud 1895).

Later, it was not least Russian so-called cultural historical psychology (see Section 5.3) that took up this thread. In the 1930s Aleksei Leontjev (1903–1979), especially, worked with the way in which man’s mental capacity gradually emerged on the basis of the challenges it met with. This work was only published in a collected form in 1959 (Leontjev 1981 [1959]). According to the cultural historical school, the use of tools is a particularly important function. These tools are of a quite different character in people than in the few animal species that make use of something similar. People can, themselves, develop and refine their tools, and today this has led to technological development which, to a quite fantastic extent, enables us to master nature, but which at the same time, by virtue of this very fact, is well on the way to undermining the natural basis on which the whole rests. But the cultural historical understanding also regards



language, cultural forms and the like, as tools we make use of in connection with learning.

Since then many other researchers have continued this approach, and today a whole branch of psychology exists that calls itself evolutionary psychology and works with this area (e.g. Buss 1999; Gaulin and McBurney 2001).

Others have worked more directly with the link between the body and the mental functions. For example, many relaxation therapists and bodywork therapists work on understanding and relieving physical tensions and inappropriate patterns of movement, and developing appropriate physical balances and bodily functions on the basis of understandings in which body and psyche are parts of an integrated context. This typically takes place either on a phenomenological (experience-oriented) basis that goes back to the French philosopher and psychologist Maurice Merleau-Ponty (1908–1961) with a starting point in body experience and body competence (Merleau-Ponty 1962 [1945]), or on a psychoanalytical basis with roots that refer directly to Sigmund Freud's own work or that of some of his followers, not least Austrian Wilhelm Reich (1897–1957) and, later, American Alexander Lowen, with a focus on overcoming the 'character armour' that can function as a barrier, or protection, against, for example, very many learning opportunities (e.g. Lowen 1967; Reich 1969a [1933]; Lowen and Lowen 1977). Mention should also be made of French-Chilean biologist Francisco Varela (1946–2001) who, with references to both Merleau-Ponty and Freud, has written about the mental as a function of the bodily ('The Embodied Mind', Varela *et al.* 1991).

Based on such approaches, it has been pointed out time and again that learning research in the Western world tends to overlook the physical elements in learning, and that learning is not only a rational matter but also builds on the bodily functions and can 'fix itself in the body' and be expressed through, for instance, bodily postures, patterns of movement, gestures and breathing.

There are many facets here, from the targeted learning of certain physical skills to more uncertain 'feelings' and more or less automatised bodily functions. It is important to maintain that these bodily aspects are the foundation that, in spite of all later developments and overlays, still emerges in our experiences, behaviour and learning and plays a greater role than we in the Western world tend to think.

In our society there is a constant, unmistakable tendency to turn the situation upside down and place the bodily side of learning as a kind of supplement to 'real' learning that is mental and rational in nature, instead of as a prerequisite and basis of this learning, both in the history of human development and the personal development of the individual. British brain researchers Mark Solms and Oliver Turnbull thus state – in line with other modern brain researchers – that, 'from the viewpoint of neurophysiology all "life events" are ultimately mediated (registered and translated) by bodily events' (Solms and Turnbull 2002, p. 233).

The presence of the body in learning is naturally clearest during the first years of life, and this has caused the well-known Swiss biologist, psychologist and epistemologist Jean Piaget (1896–1980), among others, to term the first stage in

the intellectual development of the child the psychomotoric, i.e. the psychicomovement stage (e.g. Piaget 1967 [1964]).

If we return to the school situation described in the introduction, learning to divide, for example, would, on the face of it, seem to be a 'purely' mental function. It is a case of manipulating numbers that are only present as words and other symbols. Nevertheless, the bodily foundation is part of this situation in many ways.

In the first place, it is necessary that the child's brain has developed normally in the different areas that play a part in such learning. If this is not the case, acalculia, or 'number blindness', could be present, making the learning difficult or even impossible. Or there could be physical problems to do with the ability to concentrate or communicate.

In the second place, the body must be sufficiently in balance that it has enough energy to become engaged in learning rather than having to deal with counteracting an imbalance. For example, if one is hungry or tired, or ill or in pain, this can make school learning more difficult or even prevent it to a high degree. Or it could be a case of bad humour, sorrow, worry, nervousness or another form of mental imbalance that manifests itself in the body as unease or tension. Finally, in the school situation it can typically be because the children have had to sit quietly and concentrate on the subject matter for so long that they simply need to use their bodies.

In the third place, small children especially will feel the urge to 'physicalise' learning more directly in an arithmetic situation, typically by counting on their fingers or by making the learning content visible in another way, for example, when dividing by having a certain number of balls, apples or other objects that can be placed in different piles where number and quantity can be directly sensed.

In the fourth place, problems in managing the situation, or satisfaction in having calculated correctly will also manifest themselves physically as a kind of discomfort or well-being that can, in turn, influence the attitude to learning.

All these matters are, naturally, quite elementary. Nevertheless, they are important, not least in a society where more and more learning is an unavoidable condition of life, and one must therefore learn to learn, i.e. learn to manage and economise one's own learning. At the same time these physical matters are part of a constant interaction with motivation, which is also a part of learning and is grounded in the body, and which has the effect that the different bodily interruptions can be pushed into the background when one is highly motivated for the learning in hand, but would become more urgent if the motivation were low.

In the following, when I try to develop a great number of different matters in connection with learning in more detail, I will naturally not be able to include these basic bodily matters the whole time. But it is important to be clear about the fact that they always matter, and in contexts where the bodily factor has some special significance or other I will include it directly. There will also be a great number of references to brain functions, which are also a part of physicality.

## 2.4 Learning and brain functions

The brain and central nervous system is, of course, part of the body. The reason that I nonetheless place it in a separate section is because this part of the body has some quite special and very extensive functions in connection with learning. It is here, so to speak, that the individual's learning processes take place, whether they are conscious or unconscious.

Brain research has developed explosively in recent years and, on the background of advanced new technology, has been able to make an important contribution to understanding the way in which functions such as learning, thinking and memory work. I myself am merely a spectator to this development, and in the following I draw in particular on some of the best-known works by American brain researchers, especially Antonio Damasio (1994, 1999), Elkhonon Goldberg (2001, 2005), Joseph LeDoux (2002), British researchers Simon Baron-Cohen (2003), Mark Solms and Oliver Turnbull (2002), and German researchers Henning Scheich and others (Scheich 2002; Elger *et al.* 2004).

It should, however, be mentioned here and now that even though brain research has made colossal progress, it is as yet far from being able to give exhaustive answers to the more advanced brain functions, including learning. Its particular contribution is in a quite general and a very specific area, respectively. In the general area, the research can present a lot of results about the parts and centres in the brain that are active in different contexts, what the different centres play a part in and how impulses move between the different centres. In the specific area research can tell quite precisely what happens when impulses are transferred between the individual brain cells in the electrochemical circuit within which the brain processes move – *inter alia* about the different so-called 'neurotransmitters', i.e. the chemical substances that further and inhibit transfer between the brain cells in different contexts.

But the human brain contains something between ten and 100 billion brain cells (the figures given in the literature vary considerably), many of which are highly specialised, and each cell is directly connected with up to 10,000 other cells through several billion so-called synapses or nerve cell connections (Scheich 2002). This gives almost endless possibilities of different networks and circuits, and even if the individual never even approaches the realisation of all these possibilities, the complexity of our brains towers above what even the most advanced computers can perform, among other things because the brain links reason and knowledge to what we in general call feelings and emotions, which are results of both the general development of the human species and individual experience as these have been stored in the body and the brain. Therefore, there also exists a large 'middle ground' between the two areas mentioned above. This, first and foremost, has to do with the colossal number of different circuits that make up the neurological basis of our thoughts, emotions, experiences, understandings, consciousness etc., and which seem completely impossible to map even if some day we were to acquire the kind of technology that was able to do so (Elger *et al.* 2004).

Nevertheless, in recent years brain research has delivered some results which, in important ways, can supplement and correct existing psychological understandings, in the area of learning, among others. The most crucially significant discovery in this connection is probably that in a normal, healthy brain, what we usually term ‘reason’ cannot function independently of what we call ‘emotions’ – and thus that the classical Western and scientific ideal of ‘pure reason’ is an illusion (as German philosopher Immanuel Kant [1724–1804]), although on a somewhat different basis, was hinting at more than 200 years ago in his ‘Critique of Pure Reason’ (Kant 2002 [1781]).

In the few cases where brain damage has cut the connection between the most important brain centres for ‘reason’ and ‘emotions’, respectively, we see individuals who may have retained their reason or intelligence, but can only use it in very inappropriate ways because it is not linked to the regulations carried out by the emotions. This leads to, among other things, very great problems concerning decision-making and social interaction, which are two areas where the emotional corrective to ‘reason’ plays a decisive role. It is, *inter alia*, this discovery that has led the well-known Portuguese-American brain researcher Antonio Damasio to name one of his pioneering books *Descartes’ Error* (Damasio 1994) – because, as already mentioned, Descartes is the classical exponent of the understanding of reason as the core of what makes us human beings.

Brain research fundamentally understands the mental functions, including learning, as a link between the body and the environment that enables the organism to react appropriately to the changing environment. In human beings this link has been decisively refined with the development of functions such as language, thought, consciousness and the self, everything that Leontjev (1981 [1959]) called ‘the higher mental functions’, which only exist as initial stages in the most developed primates and do not exist at all in other animals.

With respect to learning, every single learning process has its own special course that takes place in the form of certain electrochemical circuits among thousands of brain cells involved in different areas and centres of the brain. (The circuits are called electrochemical because they are electrically mediated within the individual cell, while special chemical substances called transmitters mediate the transmissions between the cells.)

Here, I shall very briefly try to present what can be involved in a quite ordinary learning process in the human brain in order to give an impression of what I regard as some important matters in the complex pattern. However, I do this with the clear reservation that it is a radically simplified account, that it by no means applies to all learning processes, and that it expresses my own selection from the many sources presenting different scientific discoveries and assumptions.

A learning process can typically start by the individual experiencing some impulses from the environment through the senses. There will often be simultaneous impulses in different sense modalities – e.g. seeing some event or other and simultaneously hearing what is said. Each of the senses forms a number of ‘images’ on the basis of these impulses (the concept of images is not used for visual

pictures only but also for other sensory impressions, e.g. 'sound images'). These pictures or impressions are mediated on to the 'working memory' or 'short-term memory' (located in the frontal lobes of the brain above the eyes and much further developed in human beings than in even the highest primates). The double term for this centre is because it functions as both a very short-term memory and as the absolutely key coordination centre, which Goldberg calls 'The executive brain' (Goldberg 2001) and which controls our thinking, decision-making processes and everything else that forms what we think of as our 'common sense'.

The mediation from the senses to the working memory takes place simultaneously via two channels, partly through the central part of the brain, which contains the most important emotional centres, and partly bypassing these centres (Damasio 1994). In this way the working memory receives impulses that reproduce the 'pure' sensory impressions and impulses that reproduce the sensory impressions together with the emotions activated by the event. The emotional impulses come a little before the other impulses, and immediate emotional reactions can occur in this ultra-short moment: one may react with aggression before one 'has had a chance to think', or one becomes terrified and 'stiffens'.

It is important that the different impulses received by the working memory have also been 'filtered' along the way through connections with the 'long-term memory' and thus have been influenced by 'memories' which the brain immediately and subjectively 'finds relevant'. It should, in addition, be mentioned that what is called the 'long-term memory' is not in the nature of an enormous archive or the like, but consists of 'traces' or 'engrams' from previous circuits. We do not know very much about how the brain 'finds out' which traces to activate among the millions of memories that each of us has acquired, and how it finds them. Sometimes the traces can also be more or less wiped out, i.e. we cannot, or only vaguely can 'recall' what we need, or we 'remember' it only partially or mistakenly. But in most cases we are able to immediately activate what we know and feel of subjective significance for interpreting and applying the impulses we receive.

This takes place in the working memory in a fraction of a second as a combination or 'deliberation' of the different new impulses in interaction with relevant re-activated imprints of earlier experience, memories, emotions, understandings and the like, and makes the individual able to react on this basis. The reaction can be extrovert in the form of action; it can also be introvert both in the shape of changes in the body and in that a print of the event with the associated emotions and reactions fix themselves in the long-term memory and thus constitute the impulse to the learning that can later be recalled and activated in connection with relevant new events or situations.

From this simplified description it is particularly important to note that the impulses we receive are coupled together with our emotions (which reflect both our current mental and bodily situation and mood and relevant emotional 'memories', e.g. about the persons who take part in the event and the content area involved) and with the results of relevant earlier learning or experience as the