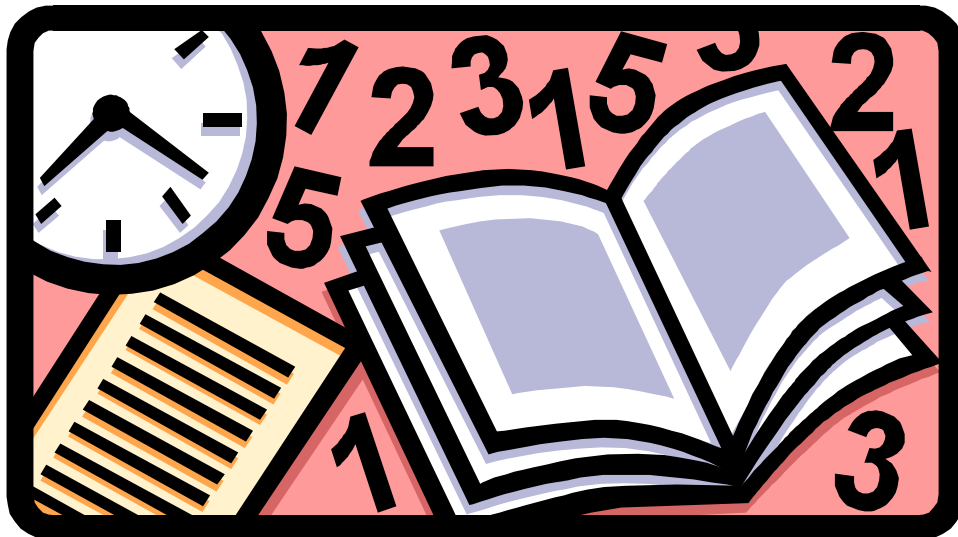




Effective Teaching



A seminar for teachers and trainers in
professional and technical vocational skills
training



Unit 1 Introduction

1. General remarks

This handout coming along with the workshop "Effective Teaching" is meant to provide general knowledge on the areas covered during the seminar. Since the training is participant-oriented, some of the topics may not be touched during the training, while others will be looked into with more depth. In any case, the handout cannot substitute the workshop since the training is, to a large extent, based on a "hands-on" approach: The main relevance of the training lies within the concrete workshop experience.

Nonetheless, this collection of basic knowledge can help you with your training: not only can you read in private and without stress about the various topics of the seminar, the handout can also be used like a tool-box from which you can pick the tools needed for your training. It hopefully provides you with general rules of teaching and inspires your planning of your instructions. Although technical knowledge and skills are the basic requirements for a trainer, they lose their value without skills in training and teaching. Thus, training skills are the transmission between trainer and student - they are one of the key factors for successful instruction.

As for content and design, this handout and the related workshop are based on the work of Konrad De Bortoli: A consultant of the German Development Service, ded, to TESDA Region VII, he conducted numerous workshops throughout the Philippines between 1999 and early 2001. All participants were provided with a handout which is the basis for this revised edition. It is hoped that the training continues to be as successful and empowering as it used to be then.

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April 2001



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Unit 1 Introduction



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Unit 2 How Human Beings Learn

1. Learning – a definition

Everybody talks about learning these days: parents, teachers, master craftsmen, bosses, professors, politicians. Very often they refer to the age of information which makes continuous, life-long learning a must. "Human beings learn as long as they live," is a true saying. We experience this every day: we are learning something new again and again, in the factory, at work, on vacation, while we travel. But what really is learning? What do we learn and how do we learn? And what is the best way to learn? In order to answer these questions, let us first look closer into the meaning of learning.

Learning has been defined in various ways. The essence of all these definitions, however, could be put as such: Learning means that we change our behavior due to experiences. This definition excludes changes of behavior due to chemical influence, like taking drugs or, due to momentarily physical changes like being tired or, changes due to genetics while growing up. On the other hand it is broad enough to include the many different ways of what and how we learn.

Definition = Learning = change of behavior
due to experiences

If learning is defined as change of behavior, learning theory can be equated with behavior theory. A good theory in this context then should enable us to explain and to predict behavior. Thus, it should make statements about human learning and under which conditions learning results are best. To understand this relationship between high learning results and the conditions required, let us have a closer look at the different types of learning.

Definition = Learning theory = behavior theory to explain
and to predict behavior



2. Different types of learning

Behavior means doing something or - also - not doing something. The fact that somebody has learned, can be seen in his/her behavior after learning, as stated already in our definition of learning. If, for example, a trainee does not change his/her behavior, then it is impossible for the trainer to know whether s/he has learned anything. This is even more obvious when we look at some examples:

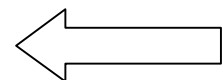
- previously, s/he was not able to explain a concept, but now s/he can!
- previously, s/he was not able to start a stop watch, but now s/he can!
- previously, s/he was not able to be on time, but now s/he can!

Looking at the examples, we can hereby identify different types of learning: Through learning we can acquire knowledge (s/he understands the meaning of the concept and therefore can explain it), skills (s/he can handle the stop watch and therefore start it) and attitudes (s/he values punctuality and therefore is on time). When we have learned something, we are able to change our behavior; we then have acquired new patterns of behavior.

Learning often is quite complex and involves all areas. Let us look at driving: What actually happens when we learn how to drive a car? What knowledge is acquired? What skills are acquired? What attitudes are acquired? What patterns of behavior are acquired? We can easily see that all three areas are involved which then results in the actual behavior of how we drive a car.

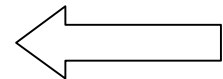
So through learning we can acquire new...

...**knowledge**



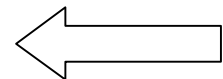
We **know** more than before.

...**skills**



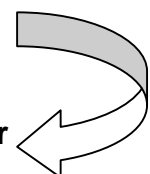
We **do** things better than before.

...**attitudes**



We hold a different **opinion** than before.

...**patterns of behavior**



We **behave** differently than before.

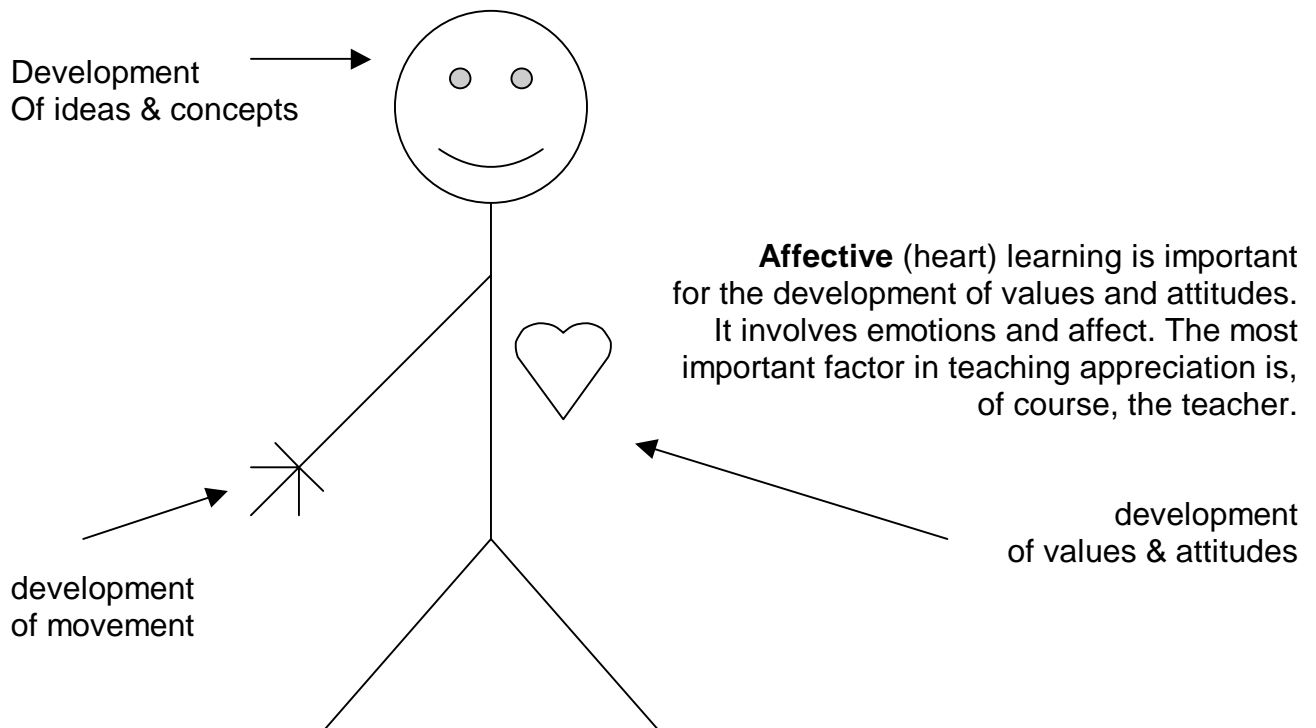


Unit 2 How Human Beings Learn



These different types of learning can also be expressed in other terms: cognitive, psychomotor and affective type. Pestalozzi, a Swiss educator, speaks of "Head, hand and heart". He recommends that successful learning and teaching has to activate all three types equally.

As we saw already, **cognitive** learning (head) is concerned with the development of ideas and concepts. It covers much of what academic learning demands. It involves, among other things, understanding, reasoning and problem solving.



Psychomotor (hand) learning involves understanding the external world through the senses and the muscles. It varies from large muscular to fine motor skills based mainly on perception. This type of learning is particularly crucial in vocational training.



3. Different ways of learning of human beings

By now, we have already defined learning and identified different types of learning. But how do we learn? Let us again look at some examples:

Trial & error

A supervisor holds a stopwatch in his/her hand, and fumbles with the crown and the pushbuttons in order to find out how it can be started, and what function the various knobs have. S/he notes what happens when operating the crown and the pushbuttons on the side. S/he becomes familiar with the functions of the watch, and can operate it to conduct the desired function. S/he has learned by trial and error.

Observation & imitation

It is shown to the supervisor how s/he can start and stop the stopwatch by pressing the various knobs. S/he watches closely and copies until s/he succeeds in operating it. S/he has learned by observation and imitation. (By the way, most of social learning is acquired by observation and imitation.)

Insight

The supervisor reads in the operating instructions that the stopwatch must be wound up carefully so that the spring does not break, and that the crown must be pressed vertically so that the axle is not deformed. S/he appreciates this and follows the advice. S/he has learned by insight.

Repeated perception

Whoever needs to look up the same telephone number frequently in a telephone directory will gradually note this number. S/he has learned by means of repeated perception.

Adaptation

As a heavy smoker a student in a class would like to light a cigarette. S/he looks around, and sees that no one is smoking, even those of his/her colleagues whom s/he knows to be smokers. S/he adapts, and from now on refrains from smoking, mostly also when it does not suit his/her environment. S/he has learned by adaptation.

Instilling in the mind

Somebody reads the definition of learning. S/he repeats it several times until s/he knows it by heart. S/he has learned by repetition, or by instilling it in his/her mind.

Repetition

So we now know that human beings learn and thus change their behavior in various ways. Of course, learning can also be very complex and thus involve different approaches that are combined.



4. Different ways of learning of animals

As in other fields, e.g. drug or food research, research on learning is also carried out on animals because, as research objects, humans are much more complicated than animals. As we all know, not only human beings can learn or change their behavior, other creatures can do so, too. We only need to think of the circus, of dancing elephants, seals playing football, cockfighting, spider-fights or boxing bears. Animals can also acquire new patterns of behavior, they are able to learn. One of the most famous experiments was carried out by the Russian physiologist Pavlov. It is commonly referred to as Pavlov's dog:

Conditioning

A dog is fed on meat. The secretion of saliva in his mouth is measured. Every time the meat is offered, a bell sounds. After about 25 repetitions, the dog secretes saliva as soon as it hears the sound of the bell, without having seen the meat. The dog has learned to respond in a particular way to a certain stimulus that means to behave as required. This is called learning by conditioning: a particular stimulus is followed by a particular response.

Reinforcement

Another famous example is Skinner's rat experiment in the so-called Skinnerbox: A rat in a cage is given food when it presses a lever while a certain light is on. It is rewarded by food when it behaves as desired. The reward of food reinforces learning. Such learning is called learning by reinforcement. A form of behavior can be promoted and changed by reinforcements.

Trial & error

Thorndike conducted an experiment with a cat in a cage: A hungry cat is locked into a cage; the door can be opened by means of a loop. When the cat draws on the loop, it can leave the cage and reach the food lying outside the cage. The first experimental sequences are characterized by random behavior of the cat: it scratches, bites the bars and runs round the cage. It eventually operates the loop by chance. In the following sequences, the time until the problem is solved becomes shorter and shorter, although the entire learning process is conducted very slowly and unsystematically. Only in the course of the final phases of the experiment does the cat operate the loop immediately it is placed in the cage. We call this learning by trial and error.

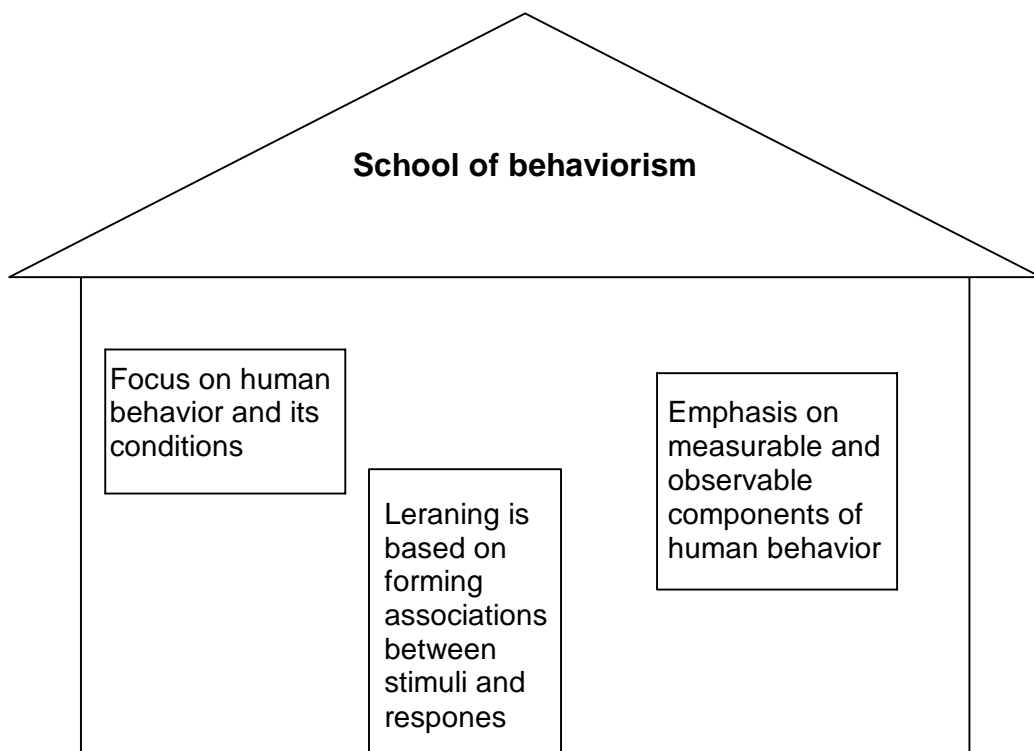
Animals can only learn in the ways just illustrated. Like animals, human beings are also conditioned: a certain form of behavior can be achieved by praise or punishment, by devoting or withholding attention (reinforcement), and certain skills, e.g. the operation of a stop-watch, can be learned by trial and error. But these simple forms of learning are not sufficient. We only need to think of learning a foreign language. It can easily be appreciated that it would take considerable effort to teach a person a foreign language only by means of reinforcement. Think of learning how to drive a car by trial and error!



The main difference between animals and human beings is their reason, their intellect, which enables them to think and to understand. They can understand what they learn. They can understand why something has to be done the way the trainer or teacher says.

5. Learning theory

Let us now have a closer look at some learning theories and what they have to offer with regard to teaching. Within psychology, there are two major schools of thinking: behaviorism and cognitivism. Behaviorism focuses on human behavior and its conditions. Being influenced by the natural sciences, the emphasis is on measurable and observable components of human behavior. Behaviorists look into the specifics. Learning according to them is based on forming associations between stimuli and responses.



Inspired by **Pavlov**, **Watson** developed a learning theory of classical conditioning: a particular stimulus will lead to a particular response. **Guthrie** took this concept a step further by linking stimulus and response: once this linkage is established – a certain stimulus is followed by a certain response -, it will repeat itself automatically. He also elaborated on three methods to change behavior: the tiring-method, the threshold-method and the incompatible stimuli method.

Thorndike introduced the law of effect: a positive condition will be reinforced, a negative condition will fade away. The more often a certain stimulus-response-reaction is practiced, the more it is reinforced. This enhanced the drill-approaches in teaching.



Unit 2 How Human Beings Learn

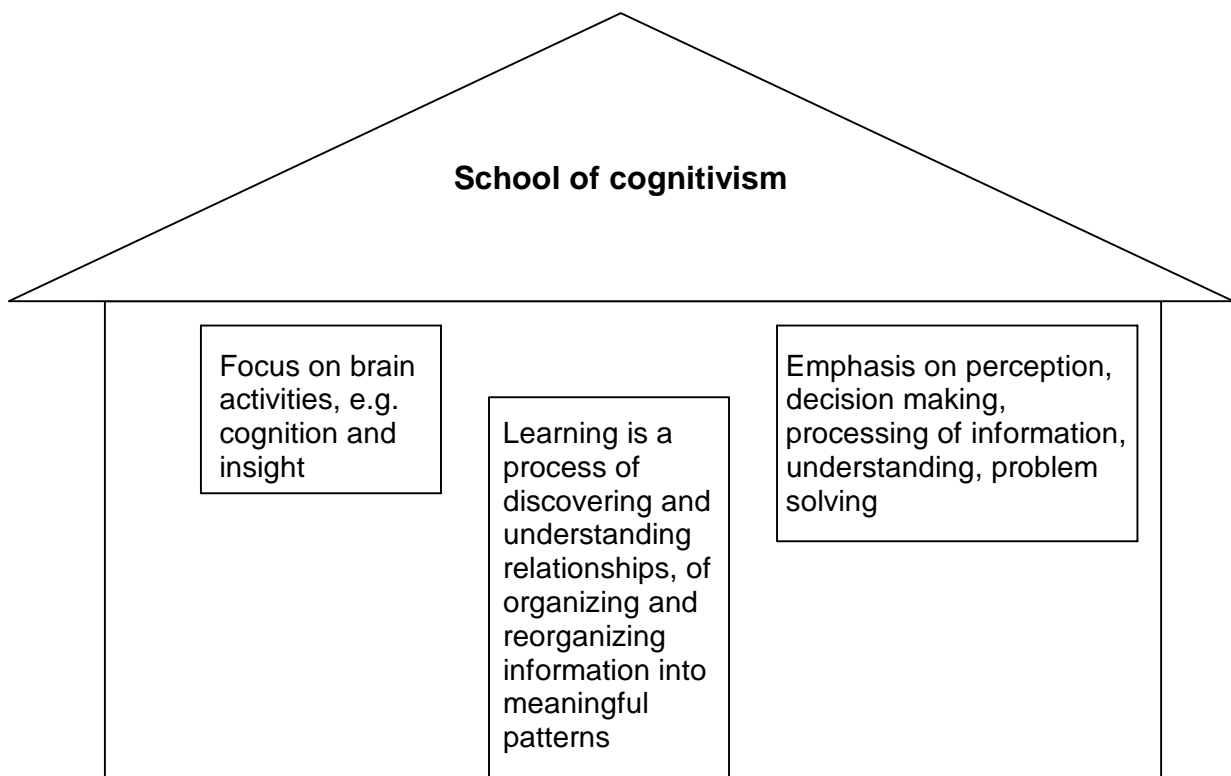


Skinner developed the theory of operant conditioning to explain behavior that occurred without a particular stimulus. To him learning is mainly a consequence of reinforcing responses. His most important discovery was that learning is most successful when it is continually reinforced in the beginning and lasts longest by intermittent repetition.

Hull tried to establish a system which would allow to forecast reactions. Central to his theory is the concept of habit: a hierarchy of habits comprises numerous stimulus-response-connections. These are related to each other by a common goal: behavior is useful by aiming for a goal. Thus habits are reinforced, also by antedating goal responses, e.g. a rat in a maze already licks its mouth when entering the last round before it actually reaches the goal.

Spence took this idea a bit further. To him antedating goal responses can by themselves be sufficient to reinforce behavior. The power of a habit does not rely on reinforcement like Hull said, it is a matter of quantity of stimulus-response-reactions.

Cognitivism focuses on brain activities such as cognition and insight. According to this school learning is a process of discovering and understanding relationships, of organizing and re-organizing information into meaningful patterns. The emphasis is on perception, decision making, processing of information, understanding and problem solving.



Hebb somehow stands between behaviorism and cognitive psychology. He developed a neuro-physiological theory according to which the phenomenon of neural activity in the brain is responsible for learning. This cell activity creates a state of arousal: The optimum functioning of human beings takes place at a medium level of arousal. The organism tries to maintain that level.



Unit 2 *How Human Beings Learn*



Tolman elaborated the theory of goal-oriented behavior. To him all behavior is goal-oriented which means behavior is not so much influenced by stimuli but by cognition. Learning then is not a result of stimulus-response-connections but cognition: to be aware that a certain behavior leads to reward. This knowledge directs behavior.

Gestaltpsychologists, among them Köhler, Koffka and Wertheimer, concentrated on synthesis instead of the classical analysis as established by Freud: they stated that the whole is bigger than the sum of its parts. Their main interest were the laws of perception which they transferred onto the thinking process. According to them human beings don't learn by trial and error but by insight.

Bruner developed a theory of categorizing. The value of what has been learned is measured by the level to which it can go beyond the given information. To him human beings categorize stimulus-events and out of this develop concepts and systems of related categories with broader validity. He recommended discovery oriented learning.

Piaget's focus was on development of the child. He identifies four stages of development and defines intelligence as an interactive process of two human ways of functioning: to rehearse previously learned activities (assimilation) and to modify behavior (accommodation). The optimum equilibrium between the two equals the maximum intelligent behavior.

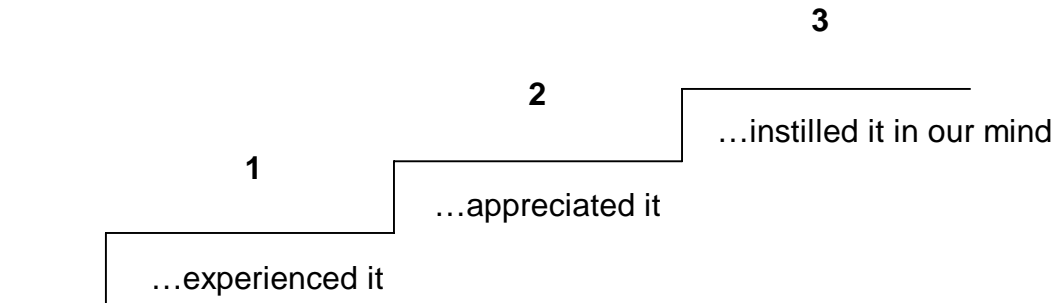
Though each of these theories emphasizes their differences, they have much more in common than one thinks at first. Historically the search for a learning theory somehow takes for granted that there is just this one theory. But suppose there isn't just one theory to explain human learning; since there are so many ways of learning, there might also be the need for many different theories to explain them. Bandura and others have developed systems which try to integrate various theoretical positions. In day-to-day teaching we should try to take into account that there are many ways of learning. Therefore our teaching methods should reflect this variety by applying different methods, so that as many students as possible can be reached and benefit from our teaching.

6. *The three steps of human learning*

Learning, as we have defined it, begins with experiencing something: from a friend, on television, in a book, from the teacher, from the trainer. We receive some – new – information. We then reflect on it, because we also want to understand and comprehend it. We try to find out what the information means which we have experienced. This understanding and appreciating of information ultimately distinguishes human learning from learning of animals. However, it is quite obvious that we also have to remember what we learned. Without memory, we would not be able to learn anything, that is, to instill something in our mind.



Therefore, we have not learned something until we have...



In professional education and training a pupil or a trainee experiences something new in class or in instruction – from the teacher and the trainer, from a book, by way of teaching aids etc. Explanations by the teacher, questions by learners, joint discussions, reflection etc. help the pupil gain his/her own insights or understanding. S/he appreciates and understands why something is as it is. In this way two important steps towards the success of learning are mostly made in class: the students experience something and they understand and appreciate it.

But unfortunately, what has been experienced and understood, has not yet been remembered and instilled. This is also true in class and in instruction. Here, too, only remembering makes learning complete and successful. Generally, more time passes than is available in class or in instruction until one has instilled something in the mind.

To achieve the latter, it is important to know what enhances memorizing information. As for understanding, it has above all something to do with logic, with consideration, with reflection, with inquiry, with explanation. We need someone to answer our questions and to explain the material to us. Remembering and instilling has above all something to do with repetition. We mostly remember only what we repeat to ourselves again and again.

To understand this better, let us look at a model of the human memory that can help us to explain its functioning and therefore understand better how human beings learn.

7. *The three components of the memory*

We should be aware that at present we are still unable to completely understand how our brain and particularly our memory functions. Therefore we are only looking at a model, which does not represent any physical structures: they are only abstracts or a concept that helps us to understand the human memory.

Accordingly, the human memory consists of three parts: the sensory, short-term and long-term memory.



Unit 2 How Human Beings Learn



The sensory memory is very limited in terms of quantity of information which it can make accessible to us and also in terms of duration: It is a phenomenon that only lasts for parts of a second. That means a very limited number of stimuli are accessible – can be remembered or noted – within a very short period of time, even though we have not paid them any attention.

For example, during a cocktail-party we can talk with someone without noting what is being said around us but as soon as our name is being mentioned, we suddenly listen. Or, we walk in the street and a good friend of us passes by. We continue to walk and only two seconds later we stop and turn around because we have recognized our friend: the sensory memory then is like an echo – therefore sometimes the sensory memory is also referred to as the echoic memory.

Nevertheless, these perceptions can lead to vital response. We only have to think of driving a car: a car horn, a pedestrian in the center of the road, a red light. Here, perceptions often trigger off essential reactions, although they only stay in the memory for parts of a second, and then are forgotten.

The short-term memory is a phenomenon that only lasts for about 20 seconds if the information is not repeated. It can store about 7 items plus or minus 2. It allows us, for example, to look up a number in the telephone directory and dial up this number without looking at it again. It allows us to forget this number immediately after we have dialed it. However, should the line be busy and we have to dial it again, we usually will have to look it up a second time.

The short-term memory is an active, ongoing process. It stores information only for a very short time – as long as it is repeated. Afterwards it deletes this information. Basically it can be said that it comprises everything that is within our attention or awareness at a given moment. As such, it can also be called the actual consciousness.

Each day we are exposed to thousands and thousands of sensual impressions through the eye, the ear or the skin. All of these impressions first enter the sensory memory where they leave a sensory mark. At the next stage they enter our short-term memory where they are associated with words and names.

If we are not attentive, these perceptions pass by like noises in the street or like the sound of a foreign language. They are regarded by the short-term memory as uninteresting for storage. Thus, the short-term-memory has the function of a filter or “door-keeper”: it decides what to let pass and store and what to dismiss and delete. This is an extremely important function, because it protects us against over-loading with information.

The long-term memory comprises everything else. It consists of encoded, consolidated information out of the short-term memory which then is equated with concepts and meaning. Not only does it store information over a much longer period

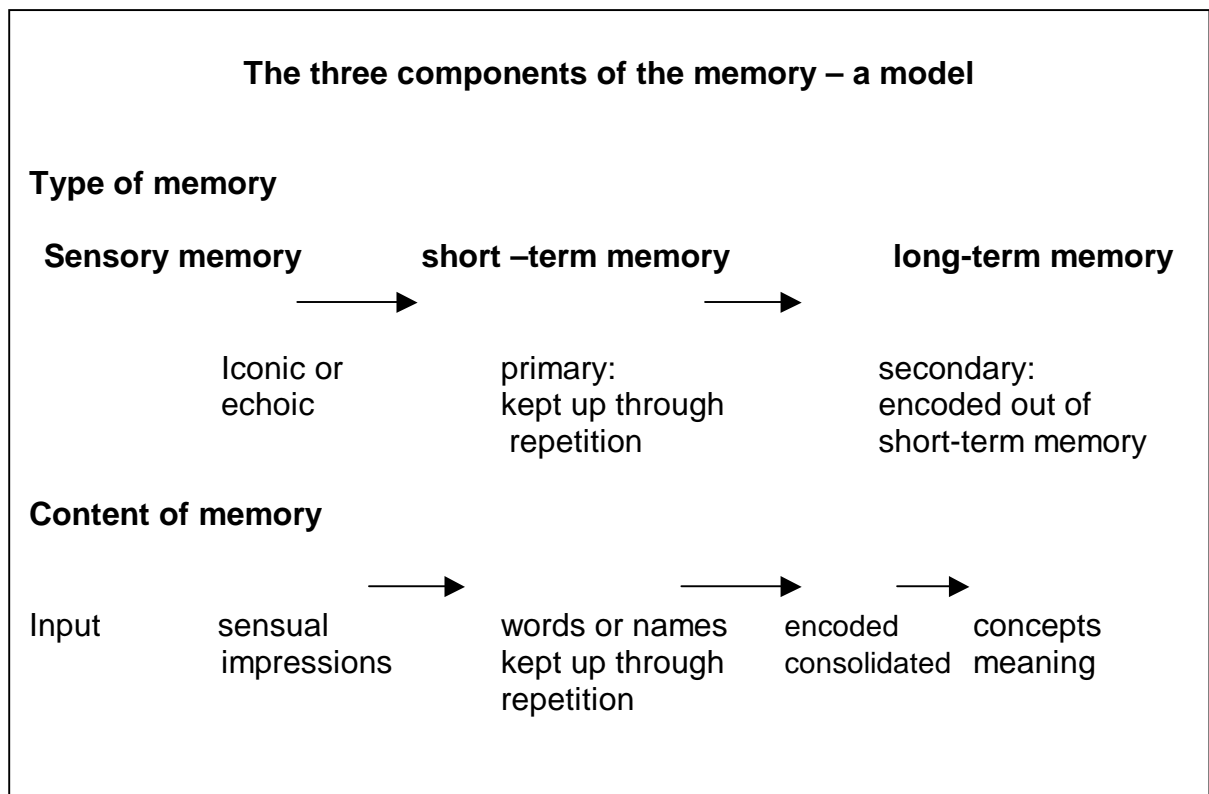


Unit 2 How Human Beings Learn



of time than the short-term memory, it also is much more passive as opposed to the active ongoing process of the short-term memory. It is also much less susceptible to interference and its capacity is much higher. While it is easy to call upon information in the short-term memory, it can take much longer to retrieve information from the long-term memory.

Previous models thought of it as a continuous recording of all our experiences, not unlike a video tape. Recent research has developed different models: they are all of an associative nature. Basically this means that all information is linked with each other and forms knots like in a big web. For example, when we search for a certain item in our memory, we don't just simply produce a long chain of answers and see whether they fit the question or not, we try to limit the area in which the information can be found by linking it with other information.





8. The sequence of learning

Looking at the model of the memory, learning has to take into account the three different components. And since the learning process presupposes a time sequence, it follows that learners must go through the 4 phases of learning: the preparation phase, the acquisition phase, the storage phase and the memory phase. To understand the four phases better, let us look at an example: we try to learn the English word " façade".

The preparation phase: concentrating & perceiving

Here we concentrate on our task. We see the word and the explanation. This perception is absorbed in the sensory memory. It is stored there only for a very short time – just as long as to leave a sensory impression.

façade

Sensory memory

Acquisition phase: naming & understanding

Here we become aware of the words as such. We learn that the word façade corresponds to the front side of a building – that is, we understand its meaning. All this takes place in the short-term-memory. There it stays as long as we pay attention to it.

Short-term memory

Storage phase: repeating & encoding

It may happen that we have really understood the meaning of the word façade but when we are asked after a few minutes, we can no longer remember it. In order to remember the meaning and to apply it later, we repeat the word and its meaning several times and encode it. This then will migrate into the long-term memory where it is kept for a very long time.

Memory phase: abstracting & linking

What has been learned, is admittedly absorbed into the long-term memory. But although we know the meaning of the word façade, it may be that we cannot remember it a few days later: The stored information cannot be recalled under every condition or at any time. To retrieve and remember stored information, we have to get abstracts of its meaning and link it with other existing information.

Long-term memory



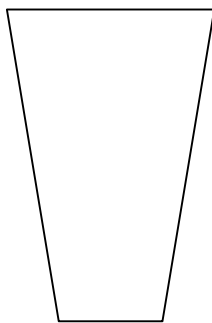
9. How to prepare information for storing

As already outlined, we have to prepare information for storage so that we can retrieve and remember it later. Let us again stay with our example: we want to learn the meaning of the word “façade”. After we have heard the explanation of the word we spontaneously think of the word “face”. We associate the word “façade” with “the face of a building”. Such linking of words is called association. When learning the meaning of the word “façade”, the word “face” is the mediator.

That way we have made use of what we learned at an earlier stage: the meaning of the word “face”. If we had not had such a mediator, we perhaps would not have learned the word “façade” that quickly.

The greater the number of connecting links, the easier and quicker the learning process. These connecting links may be words (“face”) or images (a building can have a face). The material to be learned (“façade = front view of a building”) is encoded by the connecting links. This also reflects the model of the long-term memory: all stored information is linked among itself like in a big web. In the same way encoding and abstracting are important performances in learning. The better the learning material is structured, the better we learn.

Preparing information for storage means:



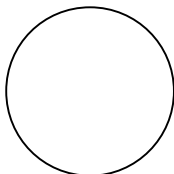
Be conscious of meaning.

Learn sensible material

Structure learning material.

Make abstracts from meaning.

Link unknown to known information.



Make use of mediators, particularly visuals.



10. How to remember information

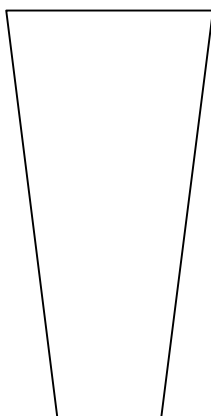
“I worked through everything and understood everything – and now I have forgotten all!”
This is the lament of many students before an examination. S/he has assimilated the material, comprehended it, but is unable to remember it.

Remembering depends on:

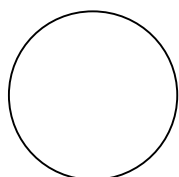
- the nature of the material to be learned
- the preparation of the material to be learned
- how often the material has been repeated

The nature of the learning material will have an impact on the learning strategy – learning a language is different from learning how to drive. Next we must prepare the material to be learned – we must organize and portion it. But remembering has above all something to do with repetition. For information to migrate from short-term to long-term memory, it needs to be repeated several times. In the same way, the more often information is repeated, the better it is remembered. As for repetition to be effective, it should take place in intervals: short breaks at the beginning, longer breaks later. Mnemonics can also be very helpful. However, the best review is application of what we have learned: Practice should be conducted in different settings, e.g. learning from a textbook, reviewing in a group together with other learners.

Remembering information means:



- Organize material.
- Portion material.
- Repeat material.
- Learn in intervals (short breaks at the beginning, longer breaks later).
- Make use of memory techniques.

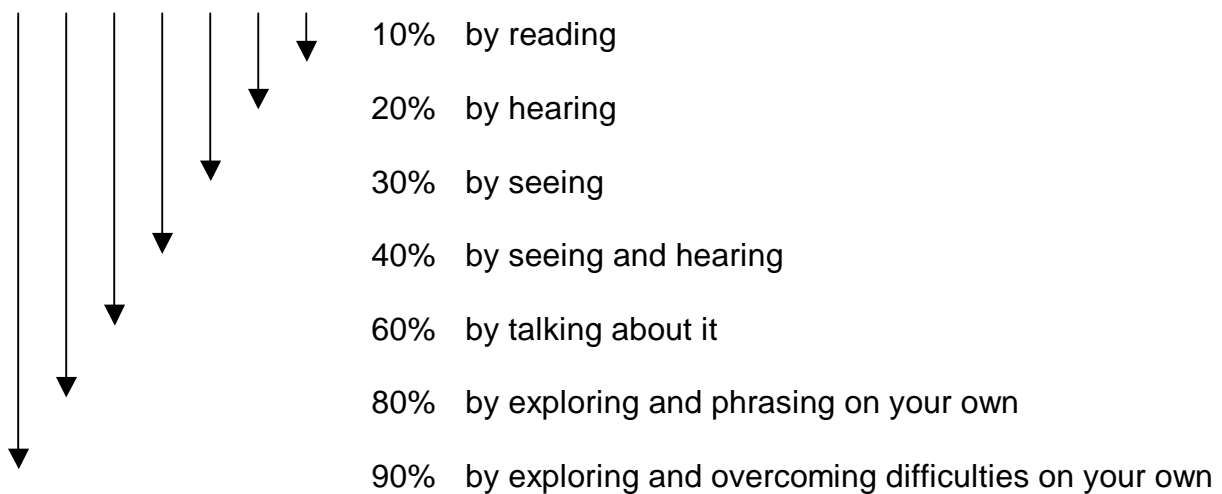


- Review material.
- Application is the best review.



The retention span of learning material also is related to the way we acquire information: the more senses are involved in the learning process, the higher the learning results. Teaching therefore should try to make use of teaching methods that incorporate as many senses as possible.

Acquiring and remembering information



11. How learning is enjoyable

As we have seen, learning is a very complex process: often, it means work, even hard work. However, we know from our own experience that we learn much easier when we are interested in a subject – we even enjoy it! Enjoying to learn is thus associated with readiness to learn, with motivation for learning: it is associated with the why and wherefore of learning.

Wherever interest in a subject is present, occupation with the corresponding material to be learned is felt to be exciting, and pursued again and again. As teachers we should therefore aim to create an interest in the subject and try to motivate our students to explore the material to be learned. Of course, curious people enjoy learning more. Learning is also enjoyable if we can link it to our own problems in life, to our own experiences or to what has been learned earlier.

Learning is also enjoyable if an incentive is created by the new task, since human beings have a need for reward and recognition by other people (extrinsic motivation – coming from without). Admittedly, the level of difficulty may not be so great that the solution is thought to be unachievable. The more frequently the learner has an achievement, that is,

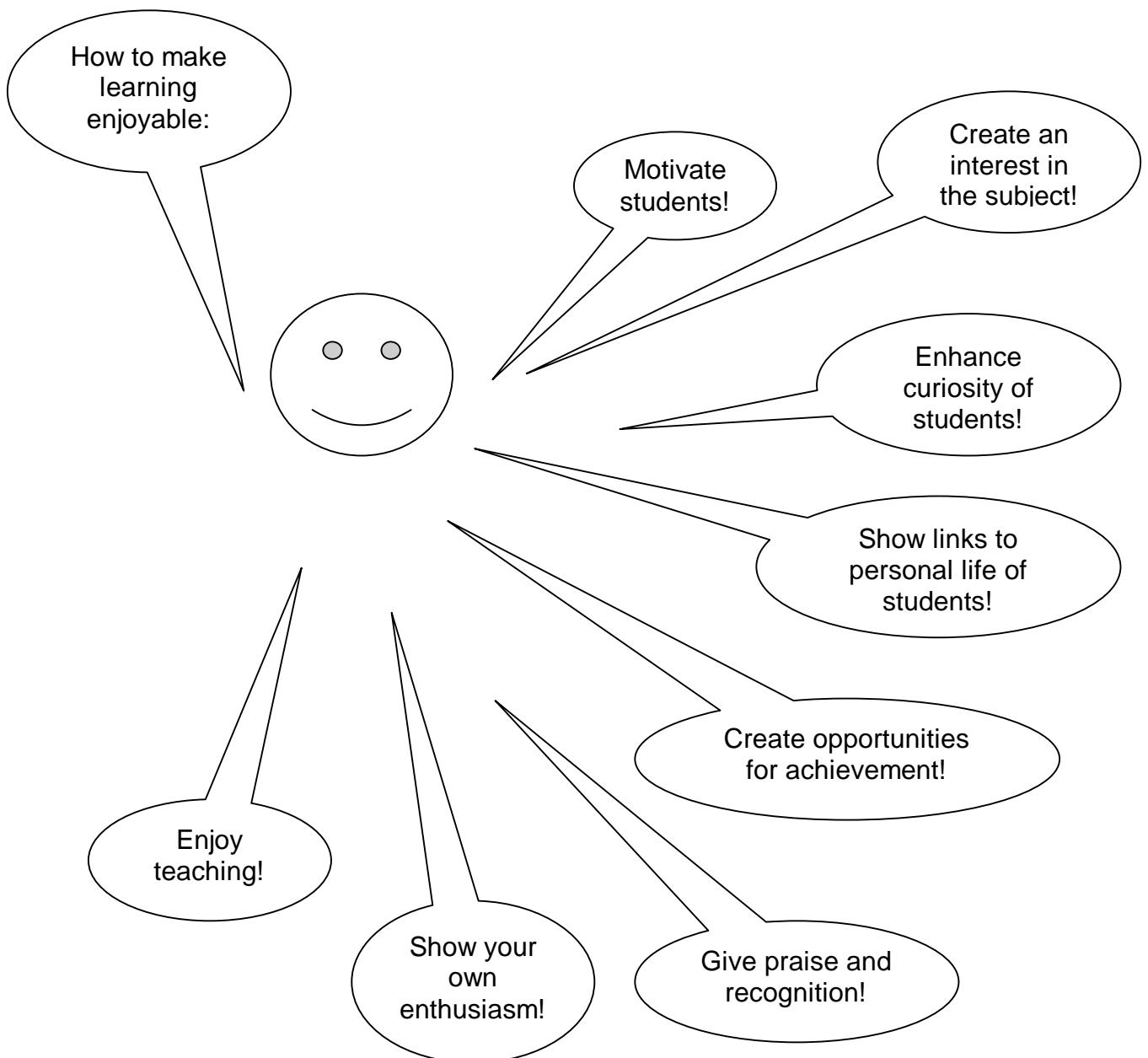


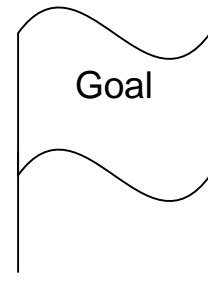
Unit 2 How Human Beings Learn



realizing that s/he can solve more and more difficult tasks, the more s/he will like the material and enjoy learning (intrinsic motivation – coming from within).

As teachers we should aim to make learning as enjoyable as possible. The best way to achieve this is to make use of our knowledge about how human beings learn and to apply this knowledge to our lessons. But foremost, we have to enjoy what we are doing ourselves: enjoy the teaching and what we are teaching. Because if we don't enjoy it how can we expect our students to enjoy learning it?





Unit 3 Learning Objectives

1. The importance of learning objectives

In the previous chapter, we had a closer look at general aspects of human learning. We also defined learning as a change of behavior due to experiences. To assess whether someone has learned something or not, therefore requires a clear statement about what is being learned (content) and how it is being demonstrated or performed (behavior) by the end of the learning process.

The precise formulation of learning objectives, with an integrated description of behavior and the contents of learning, is crucial for the learning process. If you name operationalized objectives,

- say what the pupil has to know after the lesson or how s/he has to handle, do or use something
- name the resources at her/his disposal (by using a dictionary, a tool)
- say how s/he has to do it (in which time, with what precision)

This reduces misunderstanding concerning training measures and thus helps both parties involved – the teacher and the student.

Occasionally, goals are expected to be written exclusively in the form of operationalizable objectives. This has admittedly eliminated imprecise formulations of objectives. However, the setting of operationalizable objectives often makes excessive demands on the teachers and is questionable in the case of learning achievements of higher quality resulting from longer term learning process. Complex learning objectives are very difficult to operationalize.



2. Implications for objectives

1. It is sensible – both for pupils and for teachers – to specify as far as possible the objectives of instruction and learning.
2. Objectives for a certain learner group need not be identical for all learners. They can and sometimes must be different for subgroups or individual learners according to their different preconditions of learning. Such objectives may be different with regard to the amount of subject matter covered and/or the level of achievement.
3. It is advisable to ask whether a minimum level (basis) of objectives is to be set for all learners. In that case you have to find out objectives suitable for the poorest pupils.
4. We should inform the pupils about the instructional objectives in advance. We should tell them criteria, which enable the pupil on his/her own to assess or control whether s/he has mastered the instructional objectives.
5. Specifying instructional objectives cannot and must not mean that the teacher tries to reach them in a totally inflexible way, without deviating from his pre-planned lesson structure. Teaching and learning is a process that must leave room for changes during the lesson and for alternative objectives. But we can only know that we deviate from a certain instructional objective or lesson plan, if we first have it defined precisely.
6. Only if you define your objectives precisely in advance is it possible to assess and evaluate the achievements of your students adequately to prior fixed norms. If not, you run the risk of judging out of the moment, which might not be fair to your students' performances, resulting in either over- or underrating them.

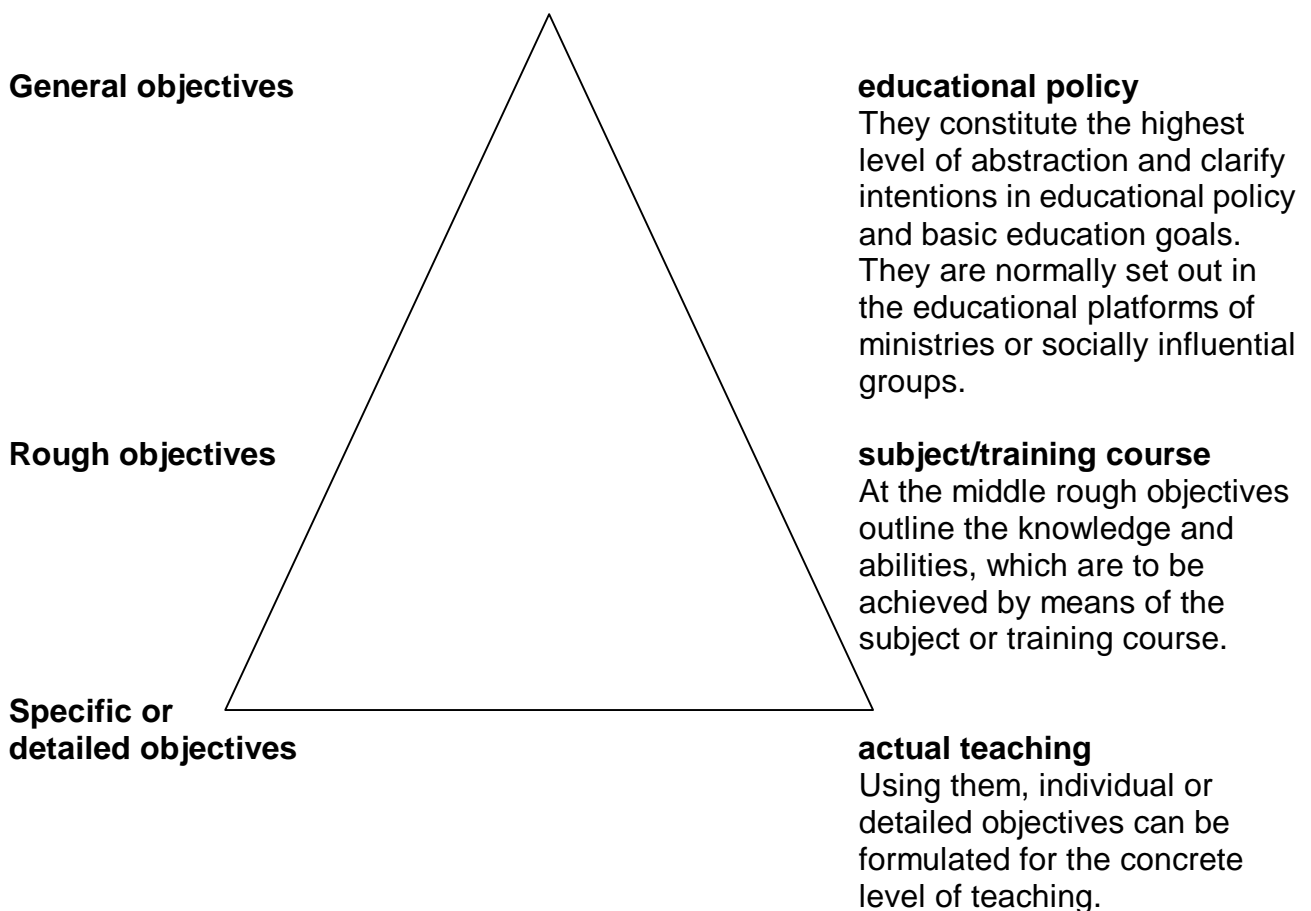
Learning objectives should be...

S	specific	stated in action verbs	S
M	measurable	indicating minimum level of concept response	M
A	attainable	according to trainee potential and field of experience	A
R	realistic	resource- and reality-based	R
T	time bound	be in coherence with the training timetable	T



3. Taxonomy of objectives

Objectives can be classified in various ways: one way is by their degree of abstraction. So we will normally find three levels: general, rough and individual (detailed) objectives. These then give rise to the pyramid of objectives, which starts from a few abstract objectives at the top, which are then broken down into various concrete and precisely operationalized specific objectives at the bottom.



Another way to classify objectives is by their degree of difficulty and by their areas: as already outlined in Unit 2, we can distinguish between cognitive, affective and psychomotor learning domains.



The psychomotor domain (hand):

Here the objectives can be ordered according to the degree to which operations have become automatic.

Level	General Instructional Objectives	Action Verbs
Perception	Recognizing a given set of actions. Watching a series of motions.	attend to, listen, look at, notice, observe, view, watch
Set-up	Positioning self for action. Recognizing given procedures as preliminary to action.	adjust, arrange, order, position, prepare, select
Guided response	Imitating and repeating performance of skilled instructor. Assuming roles or situations. Acting out pre-planned actions. Demonstrating procedures and methods.	act, demonstrate, display, exhibit, illustrate, perform, role-play, show, repeat demonstrated skill (drill, fry, paint, sew, type etc.)
Internalized response	Performing skill/task up to or exceeding established standards.	Perfecting demonstrated skill (drill, fry, paint, sew, type etc.)
Complex response	Applying internalized skill to new situations and under any given circumstances. Combining internalized skills to perform complex operations.	Integrate skill into complex actions and problem solving



The cognitive domain (head):

In the cognitive domain the hierarchy of objectives follows the principle of increasing complexity. It is assumed that higher objective levels cannot be reached until those beneath them have been dealt with.

Level	General Instructional Objectives	Action Verbs
Knowledge	Knowledge of common terms, specific facts, methods and procedures, basic concepts, principles.	arrange, define, duplicate, label, list, memorize, name, order, recall, recognize, relate, repeat, reproduce
Comprehension	Understanding of facts, principles, verbal material, charts, graphs etc. Interpreting, translating, summarizing given information.	classify, describe, discuss, explain, express, identify, indicate, locate, recognize, restate, review, select, tell, translate
Application	Applying concepts and principles in practical situations and in different context. Demonstrating correct usage of a method or procedure.	apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, perform, practice, schedule, sketch, solve, use
Analysis	Recognizing assumptions and logical fallacies in reasoning. Separating whole into parts, until relationship among elements is clear. Evaluating the relevance of data. Analyzing structures.	analyze, appraise, calculate, categorize, compare, contrast, criticize, diagram, examine, experiment, discriminate, distinguish, inventory, question, test
Synthesis	Writing a well-organized theme, giving a well-organized speech by combining elements to form a new entity from original one. Proposing a plan for an experiment. Integrating different areas of learning into a plan for solving a problem.	arrange, assemble, collect, compose, construct, create, design, formulate, manage, organize, plan, prepare, propose, set up, write
Evaluation	Judging the logical consistency of written material, the adequacy with which conclusions are supported by data, the value of a work by use of external standards of excellence.	appraise, argue, assess, attack, choose, compare, defend, estimate, judge, predict, rate, score, select, support, value



The affective domain (heart):

Here one can produce a hierarchy of objectives according to the degree to which values and attitudes have been brought into the student’s consciousness and to what degree they have been internalized and become automatic.

Level	General Instructional Objectives	Action Verbs
Receiving	Listening attentively. Showing awareness of the importance of learning. Paying close attention to the classroom activities.	ask, follow, listen, reply, watch
Responding	Performing according to received input (lecture, demonstration etc.)	answer, comply, conform, execute, follow observe, perform, practice, present, show
Valuing	Developing and demonstrating a preference according to outlined values and standards.	complete, describe, differentiate, explain, form, initiate, invite, join, justify, propose, select, share
Transferring	Appreciating values and high standards in other areas.	adhere, alter, arrange, combine, compare, defend, generalize, identify, integrate, modify, relate, synthesize
Creating	Displaying general awareness with regard to values and standards. Creating standards in which proper conditions prevail. Total behavior is consistent with values internalized.	act, discriminate, display, influence, practice, propose, qualify, question, revise, solve, use, verify



Unit 3 Learning Objectives



Let us take the process of learning of riding a bicycle as an example for the taxonomy of learning objectives in the different domains.



Hierarchy of cognitive learning objectives:

Knowledge	The pupil can name the elements of a bike: frame, fork, handlebars, saddle, wheel, pedal, chain, bell...
Comprehension	The pupil can describe how the movement of the legs causes rotation of the pedals and the front chain wheel. S/he also can describe that the chain as a link between the front chain wheel and the back wheel will advance the bike.
Application	The pupil can describe how a drum brake works by comparing their elements with those of a rim brake.
Analysis	The pupil can calculate the transmission and the speed of a bike, when different chain gears are used.
Synthesis	The pupil can make a plan how to assemble and how to adjust the ball-bearing of the front wheel.
Evaluation	The pupil can decide between two bikes which one is the best: quality of fabrication of the frame, handling, equipment, transmission.

Hierarchy of affective learning objectives:

Receiving	The pupil is listening to the teacher while s/he is telling the advantages of a cleaned bike and an oiled chain.
Responding	The pupil cleans his/her bike and puts oil on the chain, because his/her teacher has recommended it.
Valuing	The pupil prefers to use a bike which is in a proper condition and which has an oiled chain.
Transferring	The pupil likes always to use equipment which is in proper condition.
Creating	The pupil creates standards where proper conditions are integrated.

Hierarchy of psychomotor learning objectives:

Perception	The pupil observes a person who is using a bike.
Set-up	The pupil recognizes the position of pedals and own posture in relationship to the bike.
Guided response	The pupil can ride a bike a certain distance without falling. The pupil on the bike can follow a line drawn on the floor and can pass some obstacles.
Internalized response	The pupil tries other possibilities to ride a bike: Without use of the hands. Taking with him/her another person on the carrier.
Complex response	The pupil can use the bike in any circumstances.



Unit 4 Teaching Methods

1. Definition

According to the dictionary a method means the

- Method** = a way or manner of doing something
- = the use of an orderly system as opposed to luck

In the context of teaching a method means

- Teaching method** = the way a teacher uses to impart knowledge to students
- = the way of developing skills and capabilities
- = the way of facilitating exchange of experiences

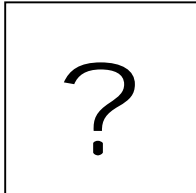
We know that we can teach the same knowledge in different ways and that different teachers prefer different methods. However, different objectives demand different structures and methods as do different target groups. Regarding all these facts we can emphasize that we need a variety of different methods to conduct a successful lesson or training.

2. The right choice

To choose the right methods we have to consider a number of aspects: First of all, does this method lead us to our learning goal? This may very much depend on the domain of learning – affective, cognitive or, psychomotor. Next we have to check whether the method is compatible with the subject, e.g. language training is different from math teaching. Another consideration is the target group: how can the participants best be reached? Age is an important fact here to be considered. Of course, participants also have to be comfor-



table with a method; the same holds for the teacher who has to be able to handle it. Last, not least, we have to assess whether a method can be realized in a given context or not.



1. Does this method lead us to our learning goal?
2. Does this method fit to our subject?
3. Does this method address the target group?
4. Are all participants - teacher as well as students - able to handle the method?
5. Is it possible to realize this method?

3. The most common methods

The most common methods are now looked at with regard to their respective advantages and disadvantages.

The Lecture

Advantages: Easy to plan; teacher pre-determines concept and flow of thought; very effective to impart knowledge.

Disadvantages: Tiring; demands intellectual activity only.

Teacher-Student-Conversation

Advantages: Intellectual activity can be better controlled and managed; freedom to speak is encouraged and is possible; more learner-centered.

Disadvantages: Only intellectual activity; not action intensive.

Discussion/Debate

Advantages: Intense intellectual activity; student can weigh her/his opinion vis-à-vis the group's opinion; creates points of view; develops tolerance.

Disadvantages: Only intellectual activity; result cannot be pre-planned.



Role-play, Planning-Game, Case-Method

Advantages: Exercise to develop complex strategies and persuasive power; exercises presentation skills; satisfies play instinct.

Disadvantages: Only simulating reality; taking much time.

Groupwork

Advantages: Very intensive; including all participants in the process of developing ideas; reduces of inhibitions; generates more solutions at a faster rate.

Disadvantages: In spite of good preparation time frame difficult to plan and predict.

Fieldtrip/ Interview

Advantages: Close to reality; high independence; recognizes the real capability of students.

Disadvantages: Taking much time; process and result can be planned only partially.

Documentation/ Presentation/ Publication

Advantages: Highly effective for instilling in the students' mind; very good method for self-assessment; exercises presentation skills; good opportunities for generalizing.

Disadvantages: Organizing public participation demands more work; time intensive.

Project/Practicum

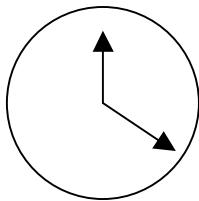
Advantages: Very close to the interests of the students; close to reality: creative; high social education components; action intensive.

Disadvantages: Much preparation and time required; open ended – unpredictable results.



4. Didactical arrangements

During the preparation we have to take into account the flow of the different methods. The student will get tired and bored if parts of the learning session get too long; s/he will stop listening and start to be restless. When there are parts which are too short, the student will get nervous and loud; s/he will feel that too much is demanded of him/her. These facts also relate to the theory that human beings try to maintain a medium level of arousal. Therefore lectures, presentations and all other activities where the teacher is in the center should not be longer than 20 minutes. As for activities during which the students are in the centre, these should not be shorter than 20 minutes.



20 – minute – rule

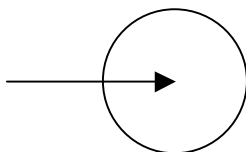
teacher-centered:

each part not longer than 20 min e.g. lecture, presentation

students-centered:

each part not shorter than 20 min e.g. group or partner work

Of course, these activities should alternate – receiving activities (= the students are passive) should alternate with giving activities (= the students are active): breathe in and breathe out! Naturally, that also relates to the retention span of information: the more we are actively involved in acquiring information, the more of it we will remember.



alternation – rule

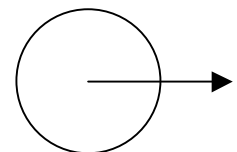
receiving activities -

giving activities

breathe in

-

breathe out





Unit 5 The Lesson

1. *General considerations*

The basic concept of the „old-school“ is often referred to as the funnel model: the teacher imparts knowledge and facts via a funnel to the students who are considered to be empty containers which can simply be filled with knowledge. This model, however, does not comply with modern research results and human learning theory as we have already seen in unit 2; on the contrary, this approach to teaching is quite counterproductive with regard to learning results.

In modern schools we therefore expect interactive lessons where the students play an active role. As we already know learning is much more effective when the students take part, can be creative, are motivated and enjoy learning. The question for pedagogy is: How can we achieve this?

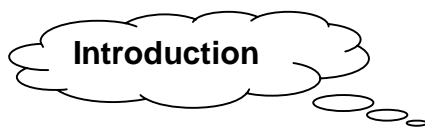
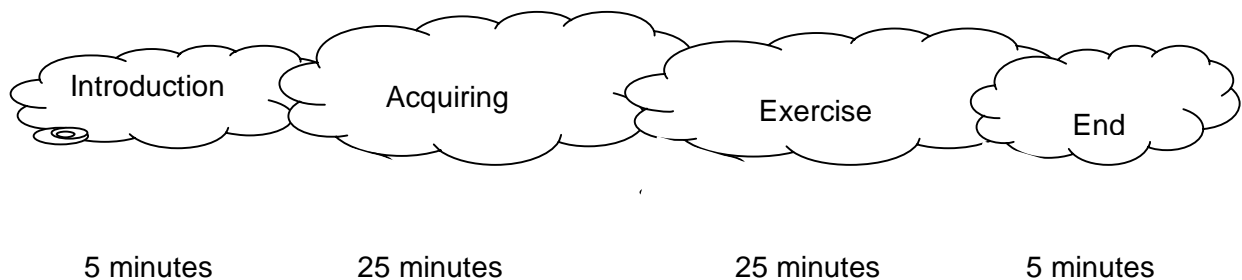
There is not one simple single recipe, but there are some basic rules and experiences. For example, we know that human beings learn almost all their social behavior by imitating other human beings. It is no surprise then that one of the most important rules states: "Learning by doing", as espoused by the American scientist of education John Dewey. As we also know already, human beings learn best, when they have to use most of their senses. There are a lot of methods of interactive/learner-centered lessons. "Copy – Use" exercises are one of the most famous.

Not so frequently used are conversation, discussion, debate, role-play, excursions, interview, documentation, presentation, publication, projects and practicum. Even if we cannot always include methods demanding intense activity, it is important to include activities which improve the lessons concerning creativity, variety and high learning results.

The creative use of these rules - despite the very different conditions of schools and classes - is the real interesting and exciting task of a teacher or trainer.

2. Basic structure of lessons

Taking into account the 20-minute-rule when choosing the right teaching method, the basic structure of lessons consists of four phases, namely: the introduction phase, the acquiring phase (mostly teacher-centered), the exercise phase (mostly students-centered) and the end. Assuming a time span of 60 minutes per lesson, it is divided into a 5 – 25 – 25 – 5 minute rhythm.



A good introduction is as important as all other parts of a lesson. The first impression of the “audience” is formed here at the start. During the introduction most of the students or participants decide whether the subject is interesting for them or not. But that does not only depend on the subject, but also on how it is presented. Therefore a good start is the most important precondition for a good “race”. There are a lot of different ways to start a good lesson; here are some basic features:

Orientation and Motivation:

- Calm down the students
- Create an atmosphere
- Inform about objectives and sequence
- Try to get the interest

Connect to well known subjects:

- Control the homework
- Repeat exercises
- Tell stories out of the surrounding of the subject
- Tell something about a famous person

Catch the attention:

- Include actual or historical linkages
- Use riddles, comics, amazement
- Use cognitive dissonance
- Create contradiction
- Use provocation
- De-familiarize



Acquiring

This is the part where the “knowledge-transfer” takes place, the working out of a subject. Here, very often the teacher is the center of the lesson unless s/he chooses a learner-centered teaching method (discovery approach).

- Impart facts, a theory or show an example
- Show an experiment
- Guide the student to a new insight
- Prompt them to detailed examination
- Let the students examine an object
- Or.....
- Or
- Look to “Teaching Methods” and “The Lecture” (Unit 4 and 9)

Exercise/ Apply

During this phase the students should be in the center of activities. Thus, they should explore the presented learning material, apply it etc. in order to find out whether they have really understood what has been presented to them.

- Use exercises with simple tasks
- Let the students try their own experiments
- Discuss in small groups about applying to similar tasks,
- Start to solve more complex problems
- Or or or

End

Here it is important "to tie up all loose ends" – to summarize what has been learned and link the activities of this lesson with further topics and tasks.

- Saving of knowledge
- Consolidation
- Teacher or students repeat/summarize/generalize
- Teacher gives prospect for coming lesson
- Homework or test for consolidation and check
- Teacher checks, assesses, evaluates
- Eventual self-assessment of activity and results
- Assessment from other students



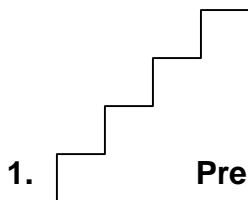
Unit 6 *The Four Step Method*

1. *Introduction*

The "Four Step Method" is a simple but very successful method for skills training. The four steps refer to the way human beings learn. The set up is similar to the structure of a lesson: We have to prepare the students, to motivate them, to open their mind (step 1). The acquiring phase here is done by demonstration (step 2). The student's activity is the applying of the newly learned skill, but still within a learning atmosphere (step 3). The exercising and strengthening take part in the real work situation, but still have to be monitored and evaluated by the trainer (step 4).

For the teacher or trainer this method requires very good explanation skills since each step of what s/he is doing has to be explained. As a skilled person one may take a lot of things for granted. However, the success of the four step method lies, among other things, in the ability of the teacher/trainer to explain exactly what s/he is doing. And remember: quality training is very time consuming!

2. *The 4 steps of the Four step method*



Preparation of student

- take away the shyness
- motivate
- show the objectives and tasks
- evaluate the knowledge
- familiarize with the work place
- give advice concerning safety



2.

Demonstration and explanation

- position the student so that s/he is standing in the same direction to the work piece as you are
- demonstrate the whole procedure in original time
- in case of complicate procedures divide them into modules and teach them step by step
- repeat the demonstration and make the single steps visible
- say what you are doing, how and why you are doing it in that way (what? how? why?)
- give the opportunity to ask questions

3.

Student activity

- encourage the student to try it on his/her own
- don't interrupt the student in his/her first attempts unless it concerns matters of safety
- make comments on serious mistakes only
- precision is more important than speed
- let the student say what s/he is doing, how and why

4.

Exercising and strengthening

- give enough time to exercise
- acknowledge progress
- control so that no mistakes are done during exercising
- change conditions of exercising
- slow adaptation to real working condition



Unit 7 Questions in Lessons

1. The exceptional quality of a teacher's question

We remember most of the acquired information when we explore it on our own, phrase it in our own words and overcome difficulties by doing so. Therefore discussions and debates play a vital role in teaching. The active participation of the learner can also help to prevent misunderstandings. At the same time the participants don't get tired because they are involved. A very common method to enhance this kind of involvement of students is the teacher-student-conversation. Within this context questions are crucial for success.

As teachers we don't ask because we do not know something, but because we want the students to learn something what they didn't know before. We want to provoke the students to think about a special item. By asking her/his questions, the teacher attempts to bring the student into a productive embarrassment and to start a learning process.

Teacher's questions are the most important medium to lead a conversation and the most important instrument for...



- Guiding the attention of students
- Arousing the curiosity of students
- Arousing appreciation of problems
- Initiating thinking
- Saving of results
- Evaluating students
- Disciplining students



2. Different kinds of questions

As already stated, questions can concern various areas. It will depend on the situation and on the purpose which question a teacher is going to ask. Here are a number of different types of questions:

Questions concerning knowledge	<i>Ex.:</i> Who was...? What is the name of....?
Questions concerning the process	<i>Ex.:</i> Are you ready now? Does everybody have a copy?
Questions concerning the relationship	<i>Ex.:</i> What's the matter with you today? Why are you so tired today?
Questions concerning the content	<i>Ex.:</i> What is this article all about? What is the summary of the first paragraph?
Questions concerning comprehension	<i>Ex.:</i> Can you tell in your own words....? Can you explain....?
Questions which initiate thinking	<i>Ex.:</i> How can we solve this problem? What are reasons for this problem?

Open questions

Allow for several and different answers;
arouse further thinking and questioning

mostly allow for just one fixed answer

Closed questions

It depends on the situation which kind of question we will ask. But there are several forms to avoid:

Chain questions: The teacher asks several questions one after the other without leaving enough time to answer

Leading question: The teacher includes the answer in the question. So it is hard to have a different opinion for the student.



- Echo questions:** Some teachers repeat the answer of the students by changing them to questions.
- Trick questions:** The teacher tries to show up the student.
- Rhetorical questions:** Rhetorical questions are a style of speech. They are not meant to be answered and should be avoided in teaching.

3. *Grade of difficulty*

To be effective and initiate productive answers of the students a question has to be neither too easy nor too difficult (demanding too much/demanding too little). Here are some samples for demanding too much:

- In a **factual** way: The teacher takes knowledge for granted which the students don't have yet.
- In a **linguistic** way: The teacher uses words, which are not known, or a style, which isn't appropriate.
- In an **intellectual** way: The teacher takes a way of thinking for granted for which the students are neither mature nor trained enough for.

Students from whom too much is demanded usually give wrong answers or keep idle and/or silent. The teacher immediately has to try to change the question to give the student a chance to respond with a correct answer. On the other hand, demanding too little often results from the fear of the teacher that the students may no longer be interested in the topic if they give a wrong answer. These students feel bored and get restless.

4. *Quality of questions*

Getting a feeling for good and bad questions is an important task for a teacher to lead discussions and to initiate a learning process. This also helps to teach students how to ask in the right way. Here are some effects and characteristics of:

Bad questions...

- ☹ are leading questions.
- ☹ demand yes/no answers.
- ☹ serve the self-portrayal of the teacher.
- ☹ try to emphasize the lack of knowledge of others.



Unit 7 Questions in Lessons



Good questions...

- ☺ make the class curious.
- ☺ are answered lightly and fast.
- ☺ show what is happening in the group.
- ☺ touch common interest.
- ☺ include the students' personality.
- ☺ do not close an issue.
- ☺ show the targets.
- ☺ make wishes visible.
- ☺ may lead to a new question.

5. Technique of questioning

It is very important to ask the right question. Therefore it is necessary to know what question has what effect:

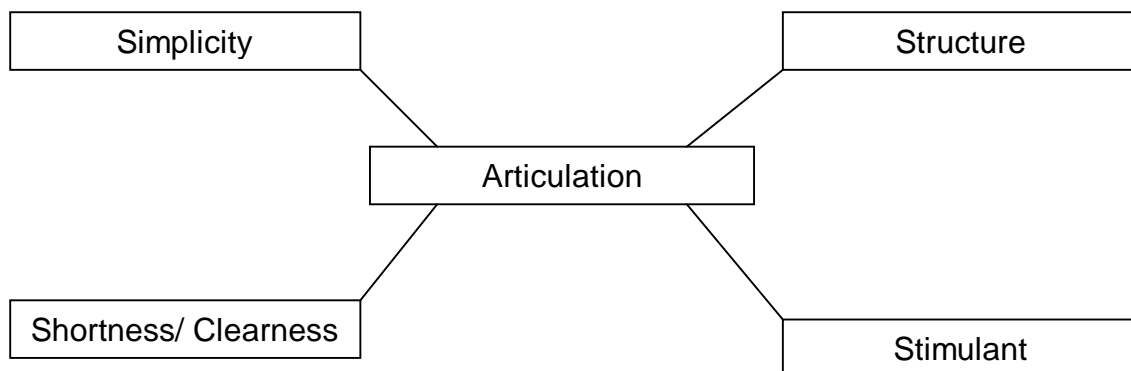
Question formulation	Effect
Starting with an interrogative Why What Who When Where HoW	Make a problem evident
Only one question per sentence	Focus on one problem; not demanding too much nor too little
Short, precise questions	Understand the problem easily
Give the question to the whole group	All students are included, start to think
Give enough time	Thinking without time pressure Chance to give reasons for the answer
Formulate open questions	Initiate thinking Opinion forming



Unit 8 The Lecture

1. Comprehensibility of lectures

The most important criterion for effectiveness of lectures is comprehensibility. To make a lecture comprehensible, five major features should be considered which are also related to one another:



Simplicity:

- Speak in simple terms
- Avoid complicated formulation or foreign words
- Give explanations of specific terms
- Use simple constructed sentences

Shortness/Clearness:

- Use short sentences
- Be exact in what you say
- Concentrated on the objective
- Be precise in your statement
- Give only important and necessary explanations
- Maximize your time



Unit 8 The Lecture



Structure:

The visible structure:

- What is the topic?
- Reasons for the topic
- Following the structure
- Summarizing

The order of ideas must follow a logical flow:

- Sequence information in a logical way
- Create relationship between different items
- Avoid jumping from one idea to another
- Distinguish between important and unimportant items
- The red thread must be visible

Stimulant:

- Support your statements by stories
- Use a pictorial language, give examples
- Visualize your statements
- Present data and facts by comparison
- Give your own opinion
- Be creative in formulation
- Show that you are interested yourself
- Create an atmosphere
- Include the opinion of a student, if possible
- React to the audience

Articulation:

This is the connector between the other four features. You need a clear and precise articulation to bring your message across. The success of a lecture depends – apart from the content - on the positive body signals the lecturer is showing. Those body signals stand for competence and credibility. There are some general rules:

Voice: speak loud and clear; make pauses, especially when you move; speak slowly; apply verbal emphasis; express enthusiasm.

Posture, bearing: stand upright; face the audience, open, not hidden; stay with both feet on the ground; raised head, but not snooty.

Arms and hands: resting position; pictorial gestures according to the speech; slow, quiet movement; avoid movement below waist; avoid putting hands into trouser pockets.



Face: face the audience, don't look from the corner of your eye, maintain direct eye contact with the audience, 3-5 seconds per person; show facial expressions related to what you say.

Movement: move single-minded, not around; calmly handle your tools, control the movement; move from the front/center of to the side of the room from time to time.

2. *Pro and contra of lectures*

In modern school systems the lecture is often considered outdated. It is a precept that the teacher has not to talk too much. So many teachers avoid this method and use others. But if we want to create a common base of information or if we want the students to know facts, the lecture is still the cheapest, simplest and most effective method of presentation!

Advantages:

- Efficient transfer of information, explanation, interrelation, facts and dates
- Easy to plan
- Provides opportunity for the creativity of the teacher

Disadvantages:

- Very low activity demand from the students
- Small feedback.
- Tiring
- Demands only intellectual activity

3. *The content and preparation of lectures*

The most important steps in preparing a lecture are the laying down, the revising and the editing of the content. During a lecture the teacher should try to portray his/her knowledge in a vivid way, therefore s/he needs to edit the information s/he has. That means s/he has to create a colorful, interesting, easily remembered and, of course, attractive material, which „reaches“ the audience best and which will be a useful basis for further reflection, discussion and use. For an expert it is not the problem to get the right information, facts and data, mostly the problem is to choose out of this pool of information those items that fit best to the objectives. To avoid „overloading“ a lecture, regard the following rules:

- Lay down the theme
- Choose the material
- Order it



Unit 8 The Lecture



- Structure it
- Limit it to the essential part
- Make a list of main points and facts
- Show the red thread
- Estimate the time frame
- Shorten

Before elaborating on the lecture it is important to ask yourself the following questions: Which kind of group is the audience? What are their expectations? If you are a teacher you can answer these questions quite fast. To work most efficiently and give an attractive lecture, which includes also talking without a script or even notes, it is important to structure your preparation according to the following steps:

Start and fix the objective of the lecture (Every lecture needs a target)

Keep discarded target formulations; these may serve as captions or key words later

Elaborate the material through brainstorming or mindmap

Work with symbols and colors

Complete and save the ideas found in the brainstorming and mindmap through reading in the literature or in your own notes

Order the key words

1. "talk-think" attempt, note the gaps, but talk

Go on ordering, filling the gaps, changing

Order arguments

Maybe a new brainstorming

2. "talk-think" attempt

Write down the good and important formulation

Work out examples

3. "talk-think" attempt

Fix phrasing, samples and quotations

Pause for inspiration (If possible some days)

Rework

Formulate the end (It is good to fix up some important phrases word by word)

Formulate the introduction (both, introduction and end, should not be more than 20-25 % of the whole lecture)

4. "talk-think" attempt with watch

Shorten (A lecture isn't well prepared if you don't have to shorten it!)

Write your notes on index cards, for every idea one card

The cards must be: well ordered, clearly written, numbered

Use different colors, make tables

Last "talk-think" attempt with watch, again memorize the pictures of the note-cards



4. The structure of lectures

There are different kinds of models for structures. These models are like "intellectual building plans", which make it easier to collect and edit the material. The following model is very common:

Introduction - Main part - End

<p>Introduction</p>	<p>Greetings, Theme, Objectives Organizational affairs Motivation</p>
<p>Transition to main part</p>	
<p>Main part</p> <p>Central idea 1 Central idea 2 Central idea 3</p>	<p>4 Structural elements:</p> <ul style="list-style-type: none"> • Signposts – important information • Bridges – make links • Fences – limit topic • Markings – give meaning <p>4 Relaxation elements:</p> <ul style="list-style-type: none"> • Questions • Examples • Comparisons • Persons
<p>Transition to the end</p>	
<p>End</p>	<p>Result/Conclusion Summarize Generalization/Prospects</p>



Unit 9 Visualization

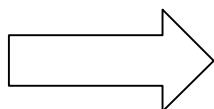
1. Why visualization is so important

As we already know, learning is most effective when all senses are involved in the learning process. Within that context visualization plays a vital role: we apparently can store and remember information far better when it is linked to images. Therefore we should aim to make maximum use of visualization in our trainings and lessons.

Of course, visualization should not be a substitute for the spoken word: It serves to supplement and illustrate what is being said. Sometimes, visualization "tells" even more than all spoken words together: Try, for example, to describe the color red in words. Or think of complex technology processes: here visualization is a vital element in teaching.

Functions of visualization

- Animation
- Information
- Documentation
- Illustration
- Securing results



Enhancing

- Learning process
- Remembering information
- Retrieving information



2. *Some basic rules*

When using text, e.g. on transparencies, be aware of the amount and how you structure it. Also pay attention to the letters as such, e.g. size, capital/small letters. Be aware of the use of colours: if not used with thought, the result may just be a colourful image without enhancing the learning process as such.

Some basic rules....

... for writing:

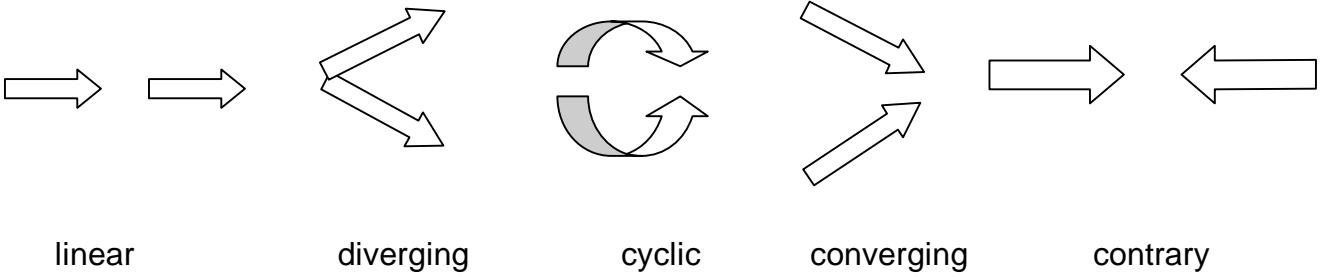
- Form columns
- Avoid whole sentences
- Use key words
- Avoid wide spacing between letters
- Avoid bold letters
- Use capital and small letters
- Same letter size for same importance
- Think of reading habits (top left to down right)
- Use only known abbreviations
- Check writing from the distance
- Show links by same colour and form

...for colour coding:

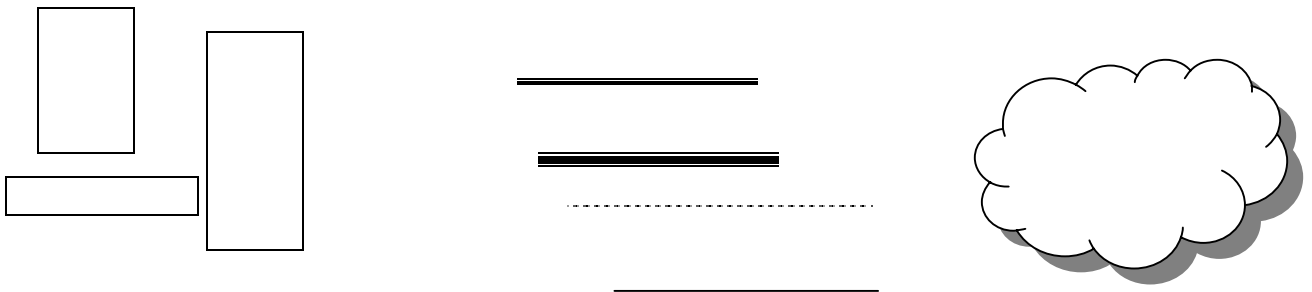
- Use neutral colour (black) for main parts
- Use red for calling the attention
- Use other colours (green, orange, blue) for emphasis
- Group according to colour (e.g. positive – negative)

3. Examples of design elements

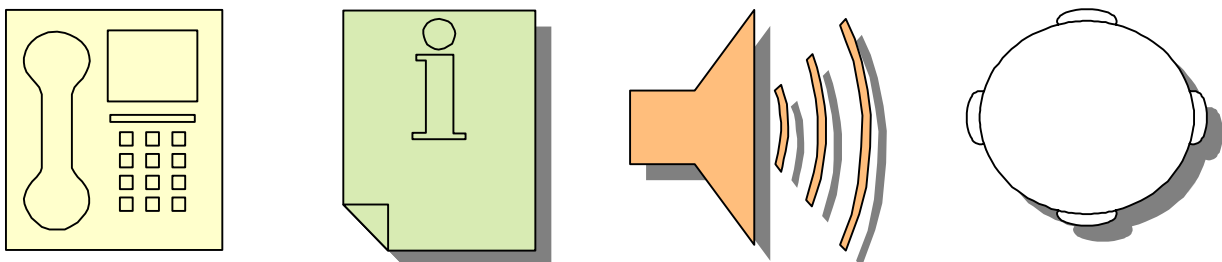
arrows



rectangulars, lines, stripes, clouds

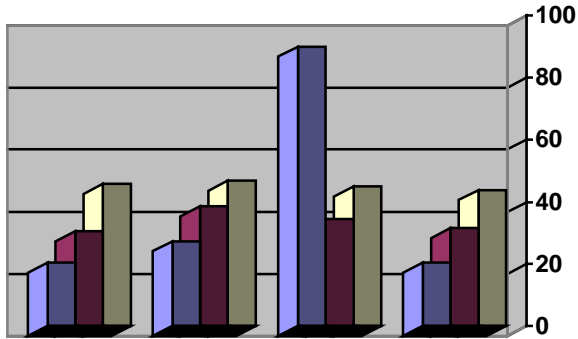


pictograms

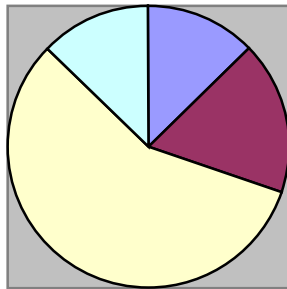




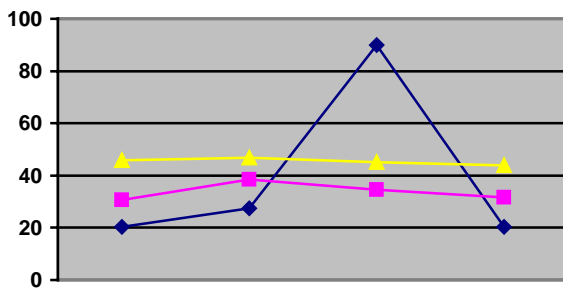
charts



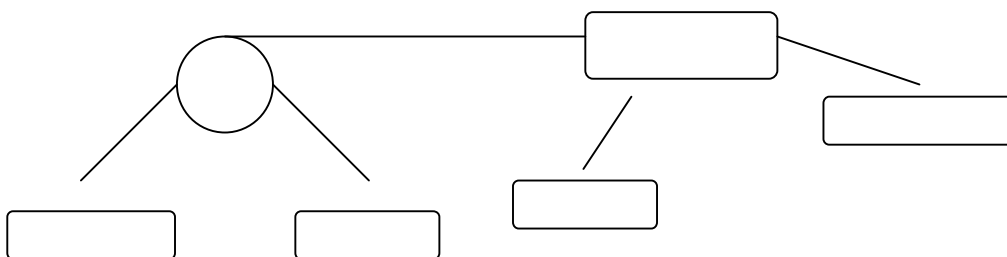
Column chart: comparison of various sizes



Pie chart: the whole and its parts



Curve chart: visualizing developments



Organigram / flow chart: visualizing structures and procedures



4. *Advantages and disadvantages of common visualizing media*

Blackboard/Whiteboard:

Advantages:

- Found in almost every classroom
- You can show developments
- Cheap
- Large space for writing

Disadvantages:

- Teacher may tend to speak with back facing the audience
- Most drawings and writings are developed during the actual teaching of the lesson
- Often not well structured

Flipchart:

Advantages:

- Focus is on page that is being displayed
- Easy to prepare in advance

Disadvantages:

- Stand and flipcharts are expensive
- Not easy to handle, particularly for small people

News-print/manila paper:

Advantages:

- Good to prepare in advance
- Good for team work
- Cheap
- Flexible

Disadvantages:

- Needs other tools like markers or crayons and scotch tape or pins
- Needs walls or boards
- Attention: beware of „paper-war“ (too many sheets displayed)
- Does not last long (cheap quality)

Overhead Projector:

Advantages:

- Takes little time to present
- Can be prepared in advance, also with the help of the computer
- You can show colored pictures
- You can keep contact to the audience while presenting

Disadvantages:

- Sometimes loud
- Demands experience in handling
- Not functioning during brown-out



Slides:

Advantages:

- Similar to overhead projector

Disadvantages:

- Not as flexible as overhead projector
- If you make your own slights, it is expensive
- You have to darken the room
- Audience gets easily tired.

Pinboard:

Advantages:

- Often mobile – you can move it around the classroom
- Flexible medium; encourages participation especially together with the use of cards and pins

Disadvantages:

- Participants must be able to express their thoughts clearly in writing
- Participants must write legibly

Power point presentations:

Advantages:

- Makes presentations interesting with the use of colors, graphics and animation

Disadvantages:

- Teacher tends to get glued to the table where the computer is based
- Needs special skill in developing slides
- Requires further expensive equipment (lcd)

5. *Teaching and visualization*

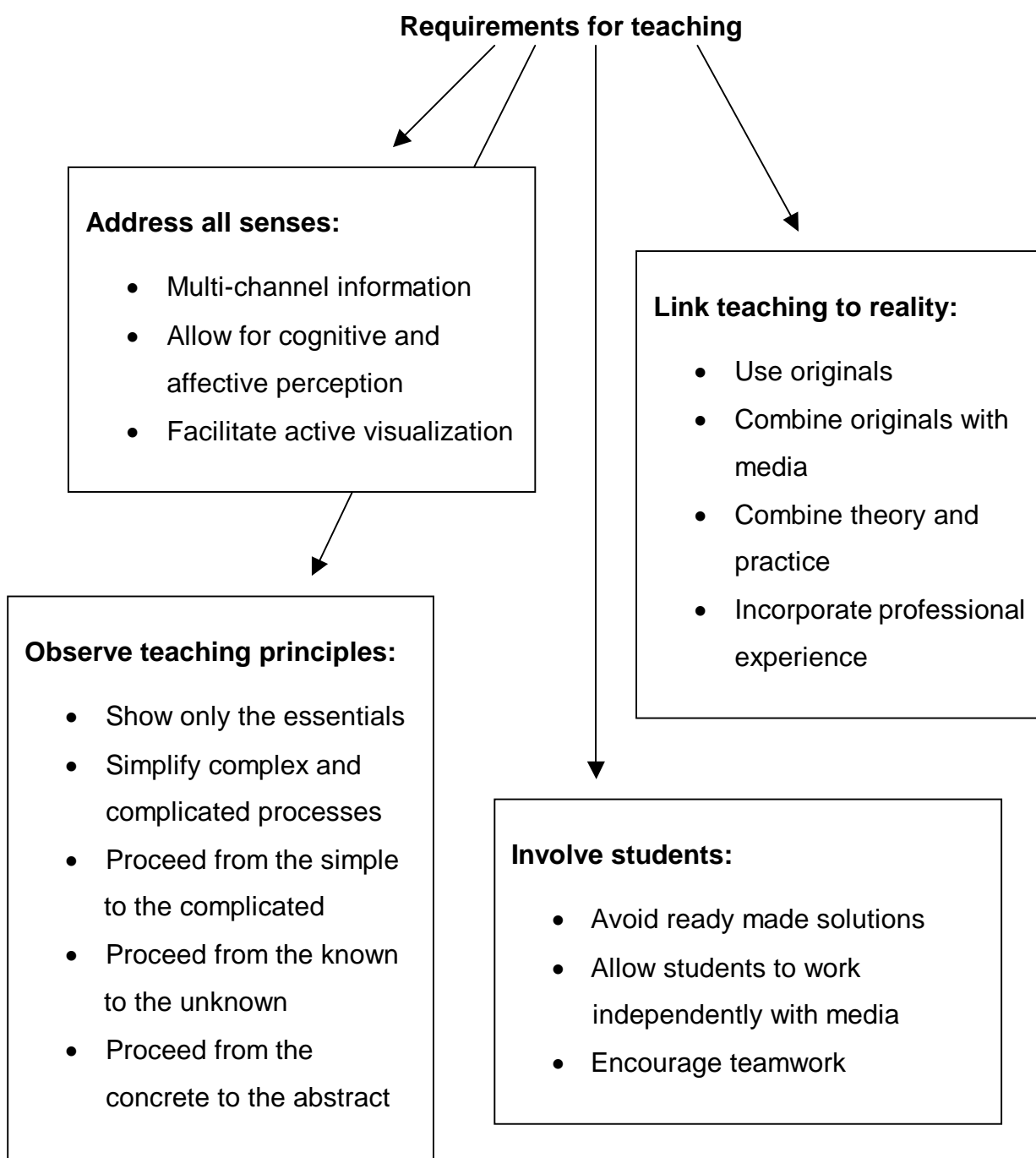
As we know already, learning results are better when many senses are involved. We therefore should try to activate as many of the students' senses as possible in order to create multi-channel information. Teaching which addresses the students' ears, eyes, sense of taste and feeling, reaches the affective (heart) as well as the cognitive (head) perception and thus can reinforce motivation. As for visualizing, it must be an active process. If the object, for example, is merely presented to the student, there is no guarantee that the information will be stored in the latter's memory. In order to learn, there must be a process of interaction with the object in question.

Direct observation of the real object facilitates spatial orientation and allows sequences of operations to be identified more easily and accurately. The ideal scenario therefore is for the actual object to be shown in a real situation. If the original is too large or the reality is too loud or dangerous, simulations or models should be used. A combination of theoretical and practical learning helps students to understand how they can apply new knowledge in real life situations. Also incorporating professional experience helps to link teaching to real life.



Complex and complicated processes can be simplified: it is important to show the essentials so that the principle of how something functions, for example, is understood. As teachers we should proceed from the simple to the complicated, the known to the unknown, the concrete to the abstract.

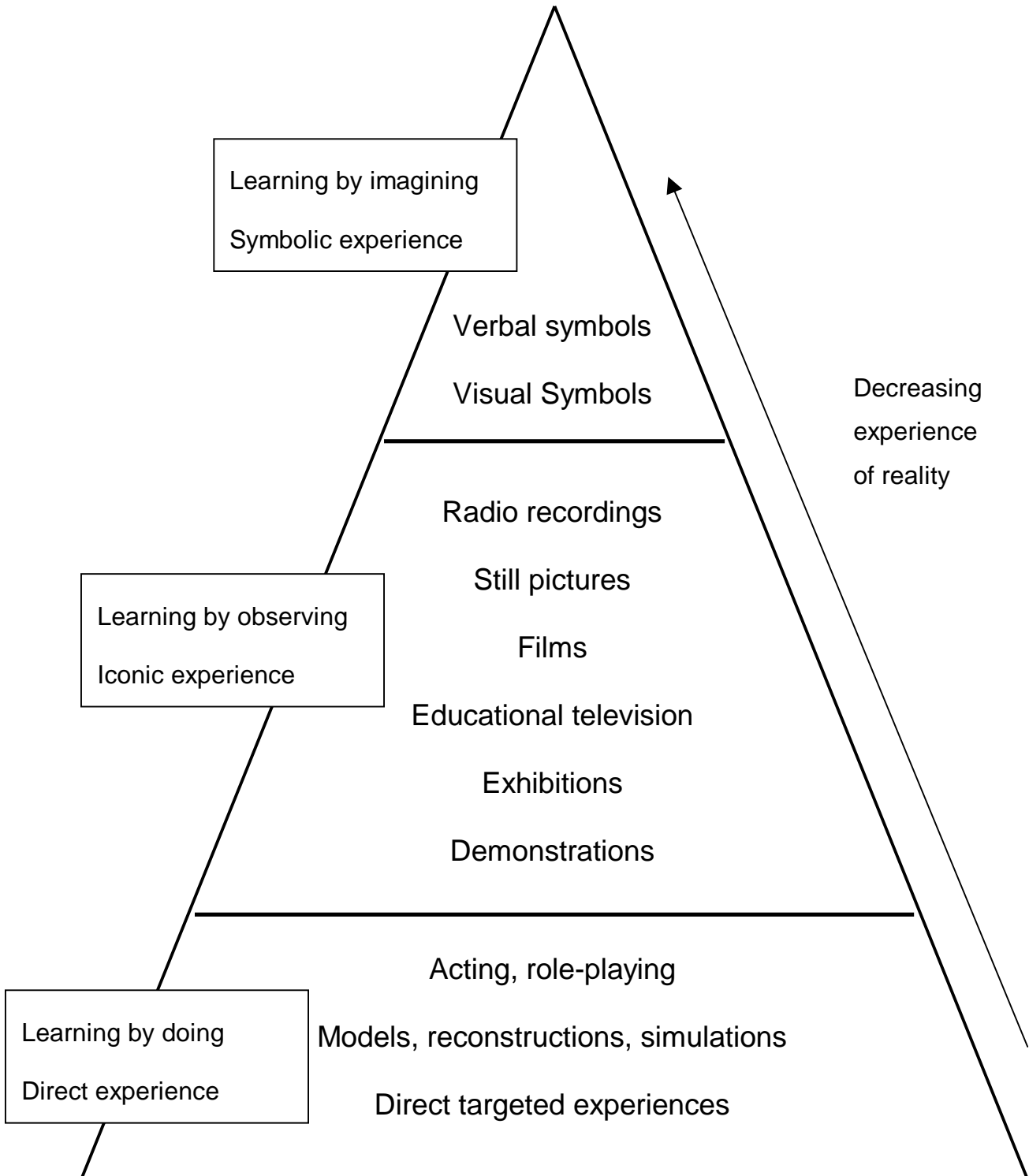
The more we involve the students, the higher the learning results. We should give opportunities for exploring and learning by discovery and teamwork; ready made solutions should be avoided.





6. The hierarchy of media in teaching

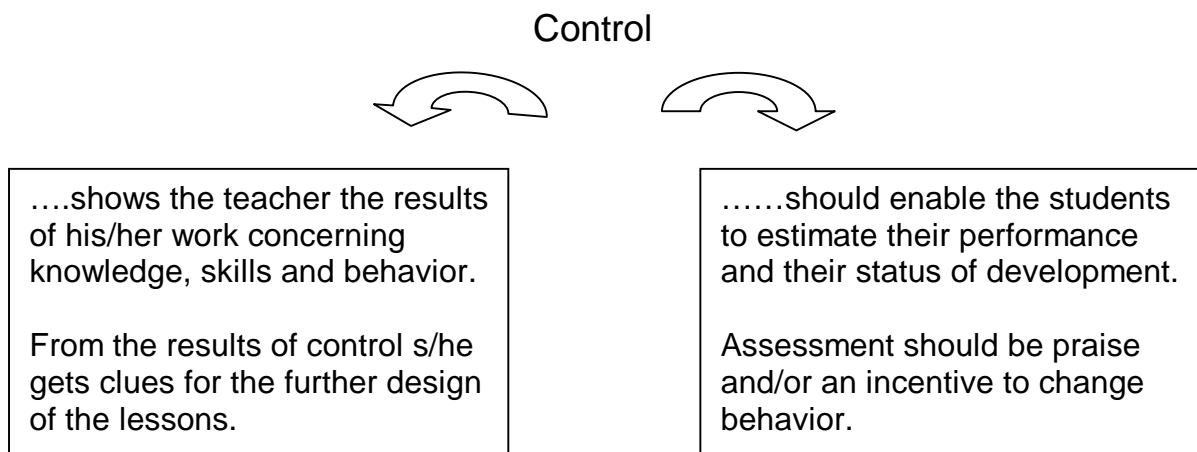
Dale's pyramid of experience





Unit 10 Control and Evaluation

1. The double function of control



The main objective of control is the **stimulation** of high learning results!

2. Demands on control

Control should be:

- objective (measurable)
- comparable (between students, classes)
- possible to evaluate and to compute

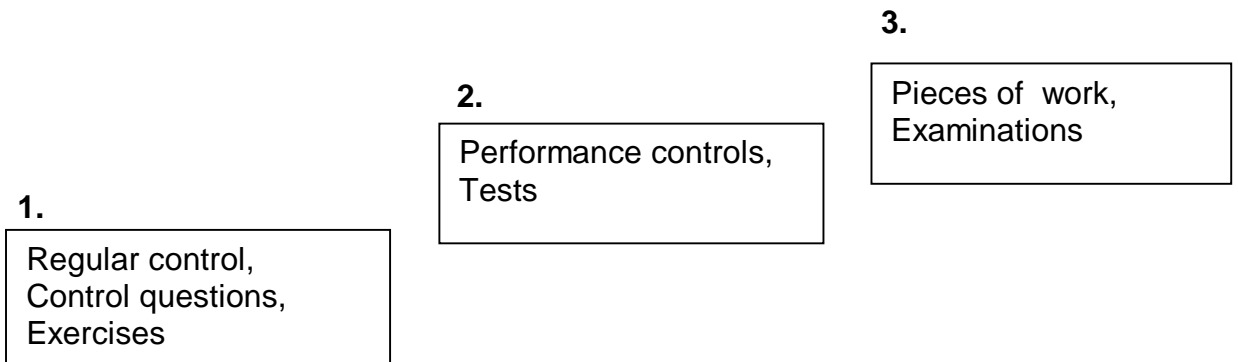
Learning objectives and control tests should correspond to a high degree. This relates to the expressions and verbs used (should be the same) and to the incorporation of the three areas of learning in the control tests:

- cognitive (knowledge etc.)
- affective (attitudes, behavior, abilities etc.)
- psychomotor (skills, practical know how etc.)



The students should know the demands made on them: Learning objectives for each part as well as demanded conditions concerning time, quality and quantity. Only what has been taught based on objectives can finally be controlled.

3. The most important kinds of control



Regular control, Control questions, Exercises

These are the most important methods for a teacher to get knowledge about the learning results, learning capability and learning success. If possible, regular control exercises should be part of all lessons.

Advantages:

- The teacher always knows the learning results by getting feed back.
- The students have the opportunity of exercising and (hopefully) feeling successful.

Disadvantages:

- Frequent controls can interrupt the ongoing processing of knowledge.
- Positive effects only show, if the control is not in a written form and does not get an important meaning: it is not considered as a test.
- Control is difficult to evaluate and judgment difficult to justify without a written document.

Performance controls, Tests

A bigger learning unit should be ended with an announced, mostly written performance control test.

Advantages:

- The students get the opportunity to see the whole subject and can prepare.
- They get relatively objective information about their level of knowledge.
- The teacher also gets an overview about the results of the last unit.
- Tests offer a relatively objective way of assessment and are easy to evaluate.



Disadvantages

- These kinds of control can easily be perceived as important breaks and opportunities to stand to the test and thus de-motivate the students to study and practice on the other lessons which they believe will not come out in the test.

When formulating tests, a variety of exercises can be used. The most important are:

- Short answer or completing exercises
- Right/wrong answer exercises
- Multiple choice exercises
- Matching and assigning exercises

However, all simple forms of tests cannot control either abilities of understanding connections and correlations or abilities of verbal expression or of applying knowledge.

Pieces of work,
Examinations

First of all, pieces of work and examinations should give an objective overview of the level of performance of the whole group. They also should enable the teacher to make a final evaluation of each student. Examinations

should be compared with general norms and scales of performance. Their main objective should not be to single out students who are less efficient.

Control of practical skills is fairly easy with regard to quality and quantity since these are measurable. However, to control and judge attitudes and abilities is a far more difficult task.

Controlling and judging skills:

- Ask for quantity only after repeating the particular skill training a couple of times.
- Increase demand for quantity step by step.
- With regard to quality insist on high standards right from the beginning.
- Note down the scale of judgment (e.g. +/- 0,05 mm off target for "well down") and make it known to the students.

Controlling and judging attitudes and abilities:

- Allow for variations to complete an assignment to discover creative potential.
- Ask for proposals to solve a problem to discover creative potential.
- Attitudes of students show when given opportunities to work creatively and on their own.



Appendix Unit 4 Brainstorming

1. *General rules for brainstorming*

Brainstorming is one of the most common methods to systematically collect new ideas for problem solving. It is most effective in teaching when problems arise that should be solved in a new way.

The ideal number of participants in a brainstorming session ranges between 5 and 10. Since brainstorming needs an atmosphere of trust and mutual respect, it should be only used when participants are quite familiar with each other. Also everybody should be aware of the rules and stick to them:

- Each idea, each proposal is wanted!
- No critique or judgemental comment is allowed!
- Quantity goes before quality – the more ideas the better!
- Ideas of others should be further developed!

The time of the actual brainstorming should be limited to 5 to 15 minutes. The moderator of the brainstorming should secure the ideas mentioned on a black- or whiteboard, flipchart, manila paper, metacards, overhead or other media.

It is the task of the moderator to ensure that all participants stick to the rules. Most important in this context is that no idea should be ridiculed or criticised however funny or strange the suggestion may be. To ensure this, examples should be given, particularly to groups that are not yet familiar with this method. To freely associate and thus come to even seemingly absurd ideas is not easy when never experienced. However, positive effects will show when brainstormings have been conducted several times.

The moderator should encourage participants to come up with ideas, but should refrain from uttering own ideas too often. When the flow of ideas stops, the brainstorming should be ended.



2. *Phases of brainstorming*

Problem:	Name the problem and explain it to the participants.
Discussion:	Allow for a short discussion (about 5 minutes). First proposals for solution can already be mentioned.
Brainstorming:	Collecting of ideas – watch the rules!
Assessment:	Judging the ideas.
Solution:	Agreeing on solution and/or further steps of action.

3. *Assessment of ideas*

Usually a lot of new ideas are collected during a brainstorming. It is part of the rules that these ideas are not assessed during the brainstorming as such. Therefore a lot of ideas appear to be unrealistic, not fit for implementation or, even absurd at first mentioning. However, the collection of ideas is a source of inspiration for finding new solutions and/or new approaches to deal with a problem.

To make use of this collection, each idea now needs to be looked at. Sometimes an idea just needs to be modified to be useful. Here are a number of questions that can be applied during the assessment process and thus help to find out whether ideas are useful or not.

Can the idea be...

- ...used differently?
- ...modified?
- ...changed?
- ...expanded?
- ...reduced?
- ...combined with?
- ...interchanged?
- ...replaced?

Usually, in problem solving we tend to stick to known solutions. The challenge sometimes, however, is to find new approaches. To allow for creative and unusual ways of thinking, brainstorming is an appropriate method to bring out new ideas – as long as the rules are followed.



Appendix Unit 9 Mind Map

1. Left and right brain

Mind map is a special visualization method. As the words imply, it tries to capture our thoughts in the form of a map, thus taking special features of the human brain into account. The human brain consists of two sides: the left and the right brain. Each side is linked with special abilities:

Left	Logic brain	Right	cReativ brain
	Speech		Creativity (new combinations)
	Calculations		Artistic activity
	Intellectual Analysis		Musical ability/Rhythm
	Reading		Emotions
	Writing		Recognition
	Naming		Comprehension
	Ordering		Perception of abstract patterns
	Sequencing		Spatial abilities
	Complex motor sequences		Facial expressions
	Critique		Holistic ability
	Evaluation		Intuition
	Logic		Images
			Color

In traditional teaching and training the left brain is usually given a higher preference. Learning results, however, are much higher when both sides of the brain are stimulated and used: analytical exercises should be combined with creative, expressive activities. When the "weaker", that is less used side of the brain is encouraged to co-operate with the "stronger" side, we will get a synergy effect (1 + 1 = 5!).



2. *Mind map and thinking process*

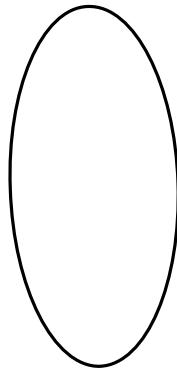
Mind mapping is a method to visualize the thinking process. It does not process the thoughts; it merely makes them visible.

Thinking doesn't follow any logic. Our thoughts jump from one topic to the next; they switch from general themes to details, or even abandon a subject completely and go on to a totally new one, perhaps coming back to the previous one at a later stage. We choose a trail, then leave it, continue on another trail and yet, we keep an overview of the whole.

This complex, associative process cannot be made visible with common linear, logically ordered and structured writing techniques. If, however, we want to tap our thinking for producing new ideas, concepts for lectures and manuscripts, for planning activities or for preparing exams, mind map is an ideal technique to keep visible track of our thoughts. Thus, it combines the abilities of the creative side of our brain (intuition, new combinations, images etc.) with the abilities of the logical side (naming, writing, ordering).

3. *General rules for mind mapping*

- The topic of the mind map is written in the center of a black/white board or a sheet of paper and circled. Central aspects of the topic are written all around the circle – they are the main branches. From these, side branches can be drawn. Whatever comes to the mind can now be written down – branches can be added or completed.
- Since boards cannot be turned around and are mostly shaped horizontally, one should try to seek appropriate position for drawing branches and lines.
- To facilitate better perception, the numbers of main branches should be limited. Also, side branches should not be subdivided too often. Branches and side branches can be differentiated by color. Also, links and connections can be made visible by color. Arrows can indicate related topics.
- If presenting a pre-fabricated mind map, write and draw clockwise. This supports better and easier perception.
- As often as possible, words should be replaced by symbols and pictures. This makes remembering easier and stimulates further thinking.





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Criteria for Feedback in Teaching

