LESSON FORM AND DESIGNING A LESSON 4

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TO THE STUDENT

1. When you have studied the contents of this chapter, you ought to be able to do the following:
   *identify the place of the lesson form in the lesson structure;
   *distinguish different teaching methods from each other;
   *describe the essential meaning of specific teaching methods;
   *show the relations among the fundamental didactic forms and the teaching methods;
   *distinguish the inductive and deductive methodological principles from each other;
   *order the learning material according to certain principles.
2. Reformulate each of the above learning aims as a question and then answer it.

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1. THE CONCEPT "LESSON FORM"

The teaching activities between teacher and pupils occurring during a lesson are correlated and interact with each other. These activities are not foreign to teacher and pupils because they are familiar in the human life world. As human activities, they are carried out and repeated in spontaneous ways among persons in everyday life. On the basis of the repetition of these activities, patterns or **forms** are discernible that are described as **forms of teaching**. Van der Stoep (1969) discerns and describes as **didactic ground forms** those life forms having specific didactic significance. The following didactic ground forms are described by him: **conversation; play; example; and assignment**.

In lesson situations there are a great number of particular nuances of the activities carried out by teacher and pupils that can be distinguished. Because these nuances of teaching and learning have their origin in the **life world** and because they are **recognized** by the pupil as **forms of living**, they will be strongly influenced by them. This fact is of particular importance to teachers designing

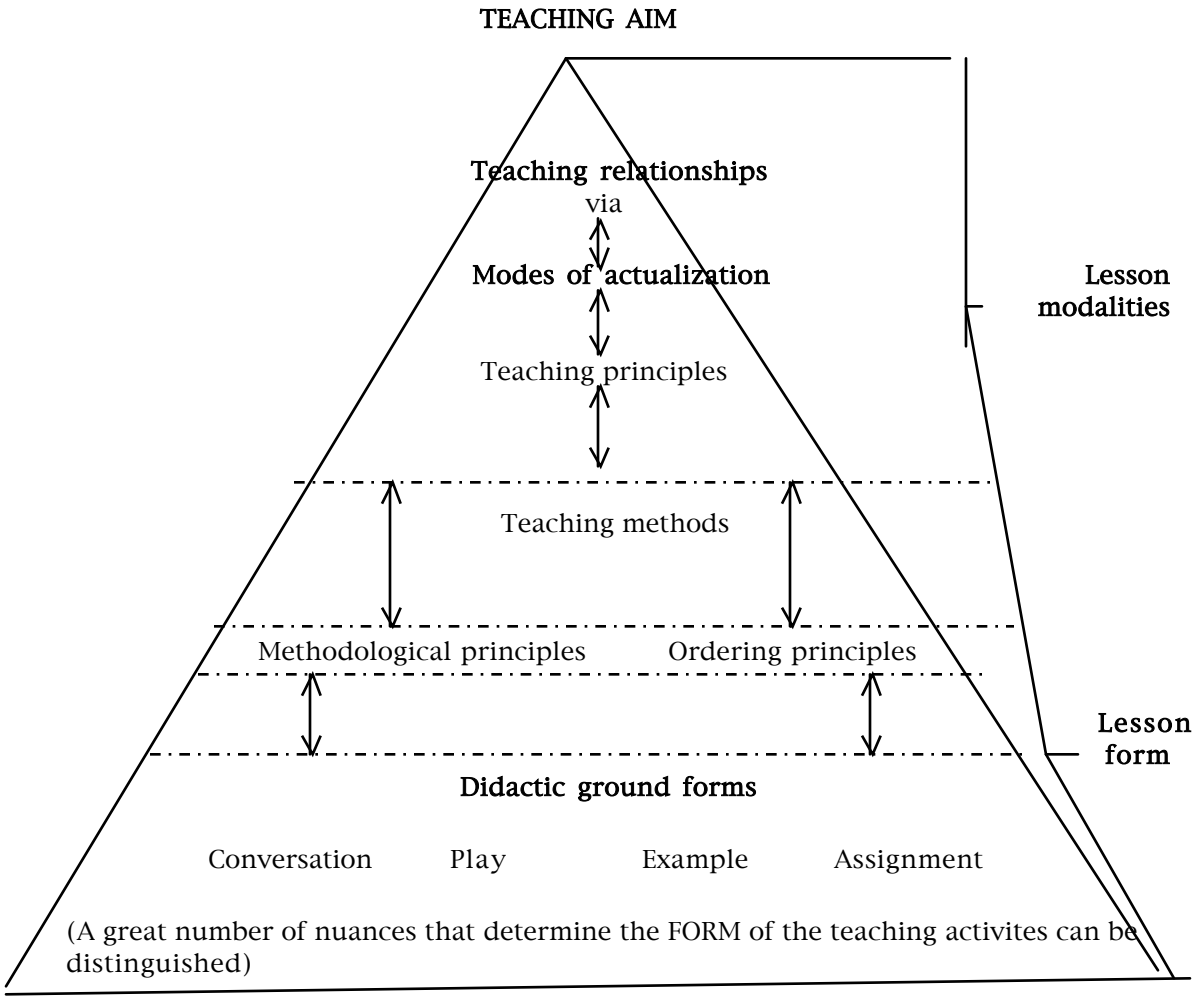
lessons because their **choice of particular nuances of teaching activities can determine and influence the teaching methods and teaching relationships** in the lesson modalities. To purposefully carry out the lesson design, the teacher has to be able to distinguish clearly among the nuances of conversation, play, example, and assignment so that purposeful actions can occur during the course of the lesson. To meaningfully design lessons, a teacher needs to know all of the subtle nuances in order to implement them separately or collectively as teaching methods. A few of these nuances that ultimately result in a type of teaching method now are considered.

What follows is based on the classification of the four didactic ground forms mentioned. However, it is noted that a teaching method cannot strictly be considered as a nuance of a **specific** didactic ground form. Thus, demonstration, as a method, can be based on conversation, or example, or play as a didactic ground form. For the purpose of designing a lesson, it is important that the essential characteristics of a nuance be delimited so designing a lesson can be done in that light. The model represented (on the next page) illustrates the relationship between lesson modalities and lesson form with teaching methods as an important link along with the didactic ground forms and the great variation of their nuances.

Introducing the refined nuances of conversation, play, example, and assignment into the lesson context makes them, in their mutual relationships and reciprocal connections, function as teaching methods. The model introduced also illustrates that lesson modalities are a particularization of the didactic form because specific nuances in interaction with each other are actualized as teaching methods in order to attain the aim of the lesson. This choice of teaching methods for a lesson occurs on the basis of three matters:

*the unique nature of the subject;
*the pupils' level of readiness;
*the teacher's potentialities (possibilities).

The teacher who purposefully wants to implement particular teaching methods in the lesson situation has to be able to



distinguish the essential characteristics of the different nuances. Different nuances of the four fundamental didactic forms are now discussed.

2. DIDACTIC GROUND FORMS

2.1 Nuances (variations) of conversation.

Regarding the design of lessons, Van der Stoep and Van Dyk (1977) provide a particularly meaningful classification of the nuances of conversation. Among others, they distinguish talking, narrating, discussing, and questioning-and-answering.

2.1.1. Talking. If talking is applied as a variant in a lesson, the teacher's aim is that the pupils give meaning to the lesson event.

When pupils spontaneously can talk about a matter or problem with the teacher or fellow pupils, they will easily join in and **participate.** Thus, the teacher's aim here is not to emphasize the correctness and accuracy of the interpretation of the content but rather to encourage the pupils' interest in the subject. As a form of living, talking is strongly focused on the content aspect of the lesson and, therefore, the pupils feel relatively free to participate because they do not feel limited by too little knowledge of the subject. Each pupil gets the opportunity to talk about his own experiences and to express them in his own words. The pupils' tension and uncertainty are abolished because the **form** in which they can communicate is familiar to them. They should very readily participate in the discussion.

While the pupils talk, the teacher should be disposed to accurately perceive what the level of knowledge is on which each pupil communicates. In this way, he can determine the insights and foreknowledge of his pupils regarding a certain topic. Also, the disposition, attitude, and morale of a group can be elevated by him.

A teaching method based on this variation of converstion as a basic form is the **class discussion.** The teacher's role is as follows:

*he has to motivate the pupils to participate;
*as leader of the discussion, he is reserved and in the background;
*he must be perceptive;
*he needs to be concerned that as many pupils as possible are able to take part;
*he must guard against the talk degenerating into a meaningless discussion;
*he needs to tactfully take steps regarding pupils who dominate the discussion.

2.1.2. Narrating. This is distinguished from talking as a variant form because it is **more strongly directed to the content** with the aim of disclosing its essentials. As a good narrator, the teacher is known as the master of his topic (subject content). His **knowledge** of the subject bestows **authority** on him in the situation, while he also can narrate with greater flexibility and suppleness if he has had **first-hand experiences** of the matter. Thus, on the basis of his knowledge and experience, he can modify

his narration to achieve more effectively his aim. A few other characteristics of narration to be kept in mind are the following:

*it must be purposeful and be completed within a specific context;
*expansive explorations easily can lead to boredom;
*this can **easily** evolve into other variant forms such as a speech, a sermon, an explication, an elucidation;
*the narrator must take the initiative, bring about a solution or climax, and determine the tempo;
*a narration is a matter of insight, giving structure, near to life expressions of feeling and enjoyment.

If a narration is genuinely carried out to attain the learning aim this is a way of teaching and, therefore, there is mention of the **narrative method**.

2.1.3. Discussing.

(a) Dialogue is the foundation of any discussion. The aim of a discussion is two-fold:

1. To further clarify or to order a problem (subject content) about which there still is some lack of clarity or some uncertainty. A point at issue, a disputed point, differences, etc. can be resolved in this way. In the classroom, this often amounts to allowing a discussion to clarify certain contents;

2. However, a discussion also can be used to awaken the pupils' interest and initiative. New conjectures and alternative possibilities with respect to a certain problem can be discussed with the aim of a later investigation (research).

(b) A few other preconditions for a purposeful discussion during a lesson are the following:

1. There has to be **trust** and a willingness for contact among the discussion partners. Trust is the precondition for a willingness for contact between teacher and pupils;

2. Concern for **real equality** among participants; i.e., all must be given the opportunity to participate;

3. There needs to be an **interchange of roles** among the participants; i.e., sometimes a pupil will **speak** and sometimes **listen;**

4. Care must be taken so that meaningful tasks are equally divided. For example:

*who states the problem and leads off the discussion?
*who is going to summarize the point of view?
*who is going to order and classify the essential points?
*are they going to be divided into groups?
*what is the assignment for each group and how must the group report back?

5. The teacher has to be concerned that the discussion takes a **purposeful** course. Judicious questions and purposeful deliberation can influence positively the course of the discussion.

(c) Teaching methods where discussion functions as a variant form of conversation are the following:

1. **Buzz-group method.**

*pupils are divided into small groups
*everyone in the group has to be able to give an opinion
*often the aim is functionalizing insights
*a short time is allowed
*each group must briefly report back to the class

2. **Think-scrimmage method.**

*the aim is to solve problems
*the problem has to be delimited and well formulated
*the number of persons in each group is approximately ten

3. **Nominal group method.** The aim here is for the group to distinguish between good and bad examples as well as solutions to a problem. Thus, pupils have to prepare and formulate examples beforehand. Then they are divided into groups and each group chooses the best examples through reaching a consensus. The best examples of each group then are written down by the teacher **without comment** on the chalkboard or overhead projector.

Each team now chooses the best examples from the large list. The rank-order of the different teams now can be compared to determine the total group's effort.

2.1.4. Question-and-answer. As a variant form of conversation, question-and-answer certainly is the most general one employed in all teaching situations. It is not only used in its pure form as a method but is used continually in connection and interaction with other variant forms. If a teacher demonstrates, explains, etc. this usually is paired with questions and answers.

To meaningfully design lessons, it is necessary to give attention to **criteria** for formulating questions as well as some **questioning techniques.**

(a) **Criteria for formulating questions.**

1. **Formulate** the question **clearly** and **unambiguously** so the learning activity that the students are to engage in is clear. Words such as describe, explain, clarify, why, how much, discuss, interpret often are core words in a question. What the pupils have to do, namely, the learning activity (thought operation), is reflected in these words.
2. Take care that everyone clearly can **hear** both the **question** and the **answer.**
3. Provide for **role interchange;** i.e., give the pupils the opportunity to pose questions.
4. Give sufficient opportunity for individual contributions by **different pupils.**
5. Encourage all students to take part, especially those who do not freely give answers.

(b) **Handling pupil answers.**

1. Give pupils practice in the skill of **clearly** answering and formulating questions.
2. Give credit for any genuine attempt. Remain appreciative if the answer is incorrect.
3. When a question is answered correctly in part, this can be pursued further by additional questions and encouragement.

(c) **Teacher's reaction to questions asked by pupils.**

1. Show genuine interest in all sincere questions and answers.
2. Encourage pupils to ask questions.
3. Evaluate each question in light of the particular aim to be attained.
4. If the teacher cannot answer a question, acknowledge this inability but promise to look up the answer, and be sure that later this answer is provided. He must not lose the trust of his pupils.
5. When pupils call into question a teacher's answer, they should be convinced by sound reasoning. In this case, pupils must not be dominated by the teacher's authority.
6. When a difference in opinion about an answer is justified, the teacher should not insist that the pupils accept his opinion.
7. Also, a question from a pupil often can be responded to with a counter-question with the aim of guiding him to a solution (answer).

2.2 NUANCES (VARIATIONS) OF PLAY.

Because play for the young child is an aim in itself, it is not often used in this way as a method in the classroom. With the toddler and first two grades, free play often is used, but for older students other variant forms of play are used to achieve teaching aims. The variant forms of play distinguished by Van der Stoep and Van Dyk (1977:83) that especially are meaningful for designing a lesson are:

*Free play, child makes own rules, e.g., playing dolls, playing store;
*Play with rules, e.g., sports, class competition;
*Play as adventure, e.g., trips, excursions;
*Play as repetition, e.g., dance, gymnastics, experiments;
*Play as unreality, e.g., dramatizing, fantasizing, improvising.

The **motivating** and **socializing** value of play is of particular value in the didactic situation.

A few methods in which play clearly functions as a ground form in relation to conversation are discussed below.

2.2.1. Competition.

In the classroom, a great variety of competitions among students can be arranged to achieve certain teaching aims. A few examples are:

*Arrange a quiz-competition among different groups of pupils with the aim of practicing insights;
*A competition where it is viewed which group most accurately can perceive how to achieve the result of an experiment;
*Competitions in all subject areas regarding neatness, dexterity, speed, etc. can be designed by teachers who take the initiative.

2.2.2. Experimentation.

This is not a pure form of play, but elements of **adventure** and **repetition** obviously are present. In subjects such as the natural sciences, there often are individual and group experiments carried out by the students. Here they are busy **searching** for solutions to problems while they **repeatedly** make observations. In its pure form outside of the classroom in a research context, an experiment often is carried out **repeatedly** in order to insure the most accurate results possible.

2.3. NUANCES (VARIATIONS) OF EXAMPLE

The example or **exemplaric** as didactic ground form is particularly important in each lesson situation. The consideration here is not about the example of the teacher as an expert or as a person; it is aspects of the example in connection with teaching that are now discussed. When lessons are designed, the subject content generally is taught in terms of good examples chosen by the teacher. In choosing an example for a lesson, it is important to distinguish among three groups.

(a) The **real example** (exemplar) or pure case is a first group from which a choice often is made. Subject areas such as physics, chemistry, botany, and zoology make use of this type of example. The real example or samples of it often are used. These types of example generally are interchangeable and exchangeable.

(b) The following group is known as the **type** or the typical case. What is essential and distinctive of a general type has to be recognizable in the typical case. Also, in contrast to an exemplar, individual cases of a particular type are not arbitrarily interchangeable. Expressions such as the following illustrate that one is dealing with a type:

* This is typical of 8th to 12th grade pupils' behavior;
* This action is typical of pupils.

The human sciences often make use of this sort of example.

(c) A third group of examples often used is **representations** or **images** of a matter. The most familiar examples here are the model, diagram, summary, thought scheme, master (expert), pattern, etc. A representation such as a model does not always look precisely like the real example since the constructor can emphasize certain aspects, e.g., with color.

The correct use of examples during a lesson is of particular importance because this brings about purposeful teaching. In the **ways** a teacher uses his examples he show whether or not he works in an exemplaric way. To work in an exemplaric way, he has to choose a good example that clearly shows or reflects the essence of what is to be taught. When he teaches, he **shows** or demonstrates this general concept in the example. His teaching activities are thus directed to pointing out a connection or relationship between the example and the concept.

Example ⟷ indication of / relationship with — concept, rule, law, characteristic, etc.

For example:

Grasshopper ⟷ Teacher shows the — characteristics of insects

Paul Kruger ⟷ Teacher shows the — characteristics of a statesman

Model of atom ⟷ Teacher shows the — concept of chemical bonding

When the teacher acts in this way to show the characteristics, concepts, etc. in the **example,** he works in an exemplaric way.

Since it is by means of good examples that concepts are taught, these ways of teaching make a certain form recognizable that is known as the exemplaric.

However, a teacher also often uses examples during a lesson without working in an exemplaric way. This occurs when the example is used for the sake of the particular example's own quality. Usually this is a striking print or model, a particularly funny phenomenon, a particular color scheme, etc. shown merely to catch the pupils' attention and interest. Thus, here the aim of the example is not to point out general characteristics, laws, rules, etc. [In this regard, refer to Section 2.2 of Chapter 3 and the discussion of the role of **sensing** in the didactic situation].

A teaching method that often uses examples is the demonstration. For the purpose of designing a lesson, it is important to give complete attention to demonstration as a method of teaching.

2.3.1. Demonstration method.

Demonstration is a composite of variant forms especially of conversation, play, and/or example [but, as indicated below, assignment also can have its place]. During a demonstration, a good example is shown while there also is narration, questions asked, and explanations given. Thorough planning is required to be able to demonstrate effectively.

(a) **Preparation beforehand.** Delimit very clearly and distinctly the learning aims to be attained by the demonstration. Choose the best example for demonstrating this learning aim. Test the demonstration beforehand to see if the apparatus works, and see that the other teaching media are put out beforehand and are in the right places in the room. It is important that the demonstration flows and proceeds without snags. Finally, make sure that all of the pupils can see the demonstration. Also, if the demonstration requires their participation, give certain assignments to the pupils.

(b) **The demonstration itself.**

1. Sometimes it is necessary to carry out the demonstration in its totality to give the pupils a notion of the total aim. After this, the demonstration can be carried out step-by-step in certain phases. In

subjects such as physical education, music and also other subjects, as determined by the topic, this approach often is followed.

2. Make sure that as teacher you point out, step by step, the essential aims. The ways things are pointed out needs to be done purposefully, systematically, and orderly. All pupils have to be able to see everything that is demonstrated.

3. The demonstrator needs to continually check on whether the pupils understand the demonstration. Well-formulated questions will help the pupils observe purposefully and think together.

4. The tempo of the demonstration requires complete control. To demonstrate too quickly or too slowly is to abandon effective teaching.

5. A summary or scheme of the essential concepts, relationships, or proficiencies should be given during or at the end of the demonstration. A good board scheme or transparency can help the pupils learn.

6. If necessary, repeat the demonstration.

(c) **End of the demonstration.**

1. If it is a (sensory or motor) skill that the pupils have to master, there has to be enough opportunity for practice.

2. However, if it is concepts or relationships that are demonstrated, e.g., by a model, assignments should be given so the pupils can functionalize these concepts. The formulation of the concepts by the pupils themselves, in writing or orally, can considerably improve the effect of a good demonstration.

(d) **Criteria for a good demonstration.**

1. The demonstration must be thoroughly prepared and tested beforehand. All teaching media have to be correctly in place beforehand.

2. The demonstrator needs to purposefully guide the pupils' perceptions, **governed** by a **good tempo**, during the demonstration.

3. All pupils have to be able to see the demonstration.

4. Is the chosen example the best one for attaining the stated aim?

5. The demonstrator needs to systematically **point out** the concepts, relationships, and skills in the **example.** The way he uses his example to point out these essences determines the effectiveness of his demonstration.

2.4. NUANCES (VARIATIONS) OF ASSIGNMENT

The meaning of assignment as a didactic ground form is that a person keeps himself busy **working** with reality. In connection with a lesson, the significance of this is that any assignment has to be carried out by a person himself. This implies self-activity although this often is carried out **jointly** with others. Personal responsibility originates here because the person himself has to be accountable for his assignment. Some teaching methods where pupil self-activity is prominent are project work, task plan, fieldwork, and programmed instruction. The aim of each of these methods is considered briefly.

2.4.1. Project work.

The aim of project work is to allow pupils to solve a problem individually or in a group. The particular nature of the problem will determine the form in which it will be carried out, e.g., in writing, orally, with posters, models, or real examples. The following important phases for purposefully carrying out a project are distinguished:

(a) **Clearly formulate the problem or topic.** The primary task of the teacher is to awaken his pupils' interest in the assignment or problem. He must determine beforehand if there are enough resources available to carry out the task. At this stage, the teacher still is strongly guiding his pupils. He can already provide criteria by which the project will be judged;

(b) **The planning phase** during which the pupils themselves read, gather material, and delimit the aims to be attained. Here the pupils have unlimited opportunity to show initiative and persistence. At this point, the teacher's role is more advisory in nature. Now the

pupils' proposed plan of action to complete the project can await the teacher's consent;

(c) **Implementing and completing** the project is the next phase. Pupil self-activity is very prominent. The teacher only provides guidance if the pupils ask for it;

(d) The teacher has to **evaluate** the project. This has to be done by using specific criteria for the sake of a uniform evaluation.

2.4.2. Task plans (Work plans).

This involves giving a written assignment to the pupils that clearly indicates the aim. They need to know precisely what to do and what resources to consult. In some subjects this can involve an apparatus used to carry out an experiment. The pupils now have to systematically and purposefully carry out the teacher's assignment. In designing a task or plan of work, the teacher has to thoroughly formulate the learning aims and plan further assignments in light of these aims.

2.4.3. Programmed instruction.

Here the pupil himself is busy working through a program at his own tempo. This can be a standard program or one designed by the teacher. The aim here is not to give a complete exposition of programmed instruction but merely to indicate a few principles so the place of programmed instruction in the framework of designing a lesson can be seen.

When pupils work through a programmed part of a subject, four principles always are important:

(a) The learning contents are divided into **small units** or frames that collectively constitute the program;

(b) The learner **actively** carries out instructions when he works through the program. Each little frame requires him to execute specific learning activities such as reading, interpreting, formulating, answering;

(c) The learner **immediately** is **reinforced,** since the answer to the question responded to is provided immediately. Only correct

answers are reinforced in a linear program. In a branching program, the learner chooses among different possible answers. Thus, in this latter type of program, provision is made for possible errors by the learner. In this way, he is lead along many paths (branches) in order to discover [and to correct] his error;

(d) A fourth principle is that the learner work through the program at his **own tempo.** Each learner thus determines his own learning tempo.

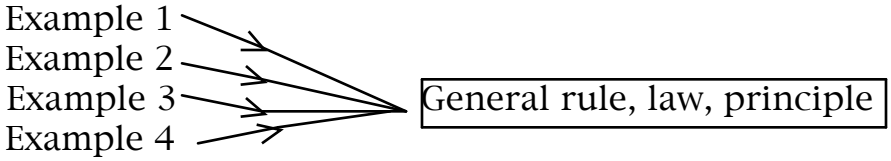
When programmed instruction is used, the teacher is freer in a controlling [i.e., monitoring] capacity. The learner, however, is actively busy attaining certain learning aims. The use of programmed instruction offers unique possibilities that the teacher can take into account in designing a lesson.

3. METHODOLOGICAL PRINCIPLES

In planning any lesson, it is important to decide if use will be made of the **inductive** or **deductive** principle. To make this choice, the teacher has to know the difference between these two principles as well as what effect they will have on the teaching and learning activities in a lesson. The ways the example(s) are used during a lesson will determine if the inductive or deductive should be used.

3.1 Inductive principle

With the inductive principle, different examples are used to infer a general rule, law, principle, or concept from them. Schematically, this is represented as follows:



During the lesson situation, the teacher, along with the learners, examines different examples and then draws certain general conclusions that are applicable to each. To guide the pupils so they educe the general rule for themselves requires a careful choice of examples and purposeful, indirect guidance by the teacher. Illustrating the example can help the pupils to more easily draw conclusions. The nature of the particular subject will largely

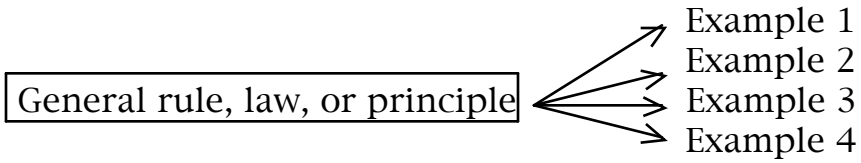
determine if the inductive or deductive principle should be used, e.g.:

Factors of 12 are: 3 x 4; 2 x 6; 1 x 12; 4 x 3; 6 x 2; 12 x 1.
From this, it is evident that 3 x 4 = 4 x 3
2 x 6 = 6 x 2
1 x 12 =1 2 x 1
Generally expressed: a x b = b x a.

This is known as the **commutative property of multiplication.**

3.2 Deductive principle

When the deductive principle is used, the teacher first has to clearly formulate the general rule, law, or principle. This can be done with the help of a good example. Now the teacher must thoroughly evaluate whether the pupils have attained a good insight and, for example, understand the law. Then the general rule, law, or principle is applied to other examples.



If the concept (general law, rule, or principle) is complex, the teacher will prefer to follow the deductive method. Then, he can address, via good teaching, certain of his pupils' problems and questions and insure that they obtain the correct insights. Now the law can be applied to other examples. For example: Show numerically how the commutative property of multiplication is valid: 2 x 4 = 4 x 2 or 3 x 4 = 4 x 3.

3.3 Choice of methodological principles in designing a lesson.

(a) When the inductive is used, the teaching tempo is very slow because discovery is occurring, but the pupils attempt to discover the concept(s) themselves.

(b) The teaching tempo for the deductive method is very fast because the concept(s) are explained.

(c) When the inductive is employed, the pupils experience different examples that help them formulate the principle or law themselves. This original experience often gives them more certainty and security in the teaching situation.

(d) The inductive approach requires of the teacher insight, experience, and thorough preparation.

(e) Difficult and complex learning contents require that the teacher first point out and clarify certain relationships. The deductive way is then the appropriate one.

To meaningfully choose between the inductive and the deductive methodological principles the teacher needs to thoroughly take into account all relevant factors.

4. Principles for ordering (arranging, organizing) the contents.

Now that the learning contents are reduced and the learning aims are delimited and formulated, the subject matter content still has to be classified in coherently ordered ways so that it is a meaningful whole for the pupils.

There are a number of principles that can serve as guidelines for ordering the learning material, namely, the symbiotic, the linear, the concentric, the punctual, and the chronological. Ordering gives the content form since it is ordered according to these principles.

*Symbiotic: the known and previous experiences of the pupils are used.
*Linear: small, linear steps are worked through to attain an aim.
*Concentric [spiral]: the level of difficulty increases so that repeated progress can be made with the same theme.
*Punctual [divergent]: a complex theme or definition is explicated with different examples. The deductive method is very prominent here.
*Chronological: an ordering of learning material according to the event's historical, temporal course.

While designing a lesson, the learning content has to be purposefully ordered. This usually occurs after the learning content has been reduced and the subject matter aspects of the aims of the phases of

the lesson have been planned. That is, planning the subject matter content for the aim of each phase of the lesson is an extremely important facet of designing any lesson.

*Actualizing foreknowledge. This is relevant learning content connected with the known and earlier experiences of the pupil. Consequently, the symbiotic principle of ordering often is conspicuous here.
*Stating and formulating the problem.
*Exposing the new learning content.
*Actualizing the new learning content.
*Functionalizing the new learning content.
*Evaluating the new learning content.

While planning these aims of the course of a lesson, the learning content has to be ordered and one or more of the principles of ordering are guidelines for doing this.

5. SUMMARY

(a) The form of a lesson is recognizable on the basis of the repeated execution of specific teaching and learning activities.

(b) Teaching methods point to the harmony between teaching and learning activities carried out to achieve the teaching aim.

(c) There is a refined reciprocal interaction and relationship among one or more nuances of the basic forms of conversation, play, example, and/or assignment.

(d) Obvious variations of conversation are talking, narrating, discussing, and questioning-and-answering.

(e) Teaching methods where discussion figures strongly are study group methods, thinking scrimmage methods, nominal group methods.

(f) Teaching methods where play figures strongly are competition, experimentation, dramatization.

(g) Examples always are very conspicuous with the demonstration method.

(h) The conventional sense of the exemplary as a basic didactic form is that a connection with the concept, rule, law, characteristic, etc. is **shown** by means of the example.

Example —— shows the⟶ concept, rule, law, etc.

(i) Teaching methods where assignment is in the foreground are project work, task (work) plan, and programmed instruction.

(j) The methodological principles are the inductive and the deductive.

(k) The reduced subject content of a lesson has to be systematically ordered. Principles of ordering usually used are symbiotic, linear, concentric, punctual and chronological.

(l) The structure of the form of a lesson is determined by the nuances of the basic didactic forms by which teaching methods are actualized and to which methodological and ordering principles are applied.

6. EXAMPLE LESSONS

In this section, a few examples are presented to show how a lesson can be designed on the basis of the guidelines described previously. Examples from different subject areas are given. Note that the **nature** of the specific subject content has a particular influence on each lesson design.

Example lesson 1: Nature and chemistry
Subject: Acids and bases
Grade: 10th
Time: 35 minutes

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1. FIRST PHASE OF DESIGNING A LESSON

1.1 Reduction of the subject contents

(a) **Names** of some familiar acids and the **formulas** for each

*Hydrochloric acid (Hydrogen chloride) HCl
*Nitric acid (Hydrogen nitrate) HNO_3

*Sulfuric acid (Hydrogen sulfate) H_2SO_4
*Acetic acid (Hydrogen acetate) CH_3COOH

(b) **Properties** of acids (concepts).

*Dissolving acid in water can produce electricity
*An acid contains hydrogen in its formula and can release an H^+ ion (proton)
*The dissolution of an acid in water can be represented by two half-reactions.

(c) **Reactions** that occur when acid is dissolved in water

1) $HCl \rightarrow H^+ + Cl^-$ (Half reaction)
$H_2O + H^+ \rightarrow H_3O^+$ (Half reaction)
$HCl + H_2O^+ \quad H_3O + Cl^-$ (Full reaction)

2) $HNO_3 \rightarrow H^+ + NO_{3-}$ (Half reaction)
$H_2O + H^+ \rightarrow H3O^+$ (Half reaction)
$HNO_3 + H_2O \rightarrow H_3O^+ + NO_{3-}$ (Full reaction)

3) $CH_3COOH \rightarrow H^+ + CH_3COO^-$
$H_2O + H^+ \rightarrow H_3O^+$
$CH_3COOH + H_2O \rightarrow H_3O^+ + CH_3COO^-$

4) $H_2SO_4 \rightarrow 2H^+ + SO^{2/4-}$
$2H_2O + 2H^+ \rightarrow 2H_3O^+$
$H_2SO_4 + 2H_2O \rightarrow 2H_3O^+ + SO^{2/4-}$

1.2 Learning aim for the lesson

After the lesson, the pupils will be able to do the following:

*write down the scientific and general name as well as the formula for each of four familiar acids;
*formulate three characteristics of an acid;

*write down the reactions that occur when the acid is dissolved in water.

1.3 Anticipation of further planning and application of particularized principles

From the reduction of the content, it appears that the students have to **memorize** the **generic names** of the acids as well as their **formulas.** Three basic characteristics of an acid need to be **clarified** so the pupils understand them. One characteristic (concept) of an acid, namely, the conductivity of electricity can be shown experimentally. The concept half-reaction and the reaction equation of how acid dissolves in water have to be accurately **explained.** This aspect especially indicates the nature of the subject content (first principle of particularization).

Now the teacher has to decide whether to let this group of students experiment themselves or possibly whether he should demonstrate because the **pupils** are still uncertain and dependent and possibly he still needs to vigorously guide them as a teacher. These are particularized principles that he needs to consider before proceeding to the second aspect of designing the lesson, namely, the aims of the course of the lesson.

2. SECOND PHASE OF DESIGNING A LESSON

This involves selecting and ordering specific subject content that is going to be treated according to the aim of each phase of the lesson. Now it is important to delimit the specific subject content for each aim of the course of the lesson before deciding **how** (lesson forms and modalities) they are going to be presented.

2.1 Actualizing foreknowledge

Anticipate what these pupils already know about acids from their experiences or in accordance with the syllabi studied in previous years:

*acetic acid in the house;
*acid is put into the swimming pool;
*acid is put in an automobile battery;
*acid such as boric acid is used in the house.

2.2 Stating and formulating the problem

The teacher now has to determine precisely what aspects of the content regarding acids will be unfamiliar and foreign to the pupils. It is these aspects of the content that have to be experienced by them as a problem; e.g., what happens to the acid when it is dissolved in water?

2.3 Exposing new contents

The following contents from the reduction now have to be mastered by the pupils:

*characteristics of acids;
*reactions of hydrochloric acid when dissolved in water (reaction 1);
*experiment with nitric and acetic acid.

2.4 Controlling new insights

The reactions of nitric and acetic acid dissolved in water (reactions 2 and 3).

2.5 Functionalizing insights

*The reaction of sulfuric acid that is dissolved in water is written down by the pupils **themselves**.
*Characteristics of acids and other reactions already dealt with are practiced.

3. THIRD PHASE OF DESIGNING A LESSON

This is the final phase during which, for each aim of the course of the lesson, the content is brought into harmony with the form and modality aspects of the lesson. The **what** (content) of the lesson now needs to be brought into harmony with the **how** (form and modalities) of each facet.

3.1 Actualizing foreknowledge

(a) **Subject content.** Relevant foreknowledge from the pupils' experiences has to be actualized: acetic acid in the kitchen; acid in swimming pools, batteries, etc.

(b) **Lesson modalities and form. Collective actualization** during which the teacher **asks questions** and points out **real examples** of acids from the pupils' experiential world. The **inductive** methodological principle is used and the **symbiotic** principle of ordering is very conspicuous. The teaching tempo is quick, approximately three minutes.

3.2 Stating and formulating the problem

(a) **Subject content.** The following problem regarding the subject content has to be actualized: what happens with the acid when it is dissolved in water?

(b) **Lesson modalities and form. Guided actualization,** based on a brief **demonstration**, where it is pointed out that when the acid is mixed with pure water, electricity is produced. Further guide the pupils by **questions-and-answers** to formulate the problem. The **inductive methodological principle** with **symbiotic** ordering is still conspicuous. Tempo is now slightly slower to provide the opportunity for thoughtful pauses, approximately three minutes.

3.3 Exposing new content

(a) **Subject content.**

1. Names and formulas of a few known acids:

   *Hydrochloric acid (Hydrogen chloride) HCl;
   *Nitric acid (hydrogen nitrate) HNO_3;
   *Sulfuric acid (Hydrogen sulfide) H_2SO_4;
   *Acetic acid (Hydrogen acetate) CH_3COOH.

2. Properties of acids:

   *an acid contains hydrogen in its formula and can release an H^+ ion (proton);
   *dissolving an acid in water produces electricity;
   *the dissolution of an acid in water can be represented by two half-reactions, e.g., that of hydrochloric and

nitric acid (see reactions under reduction of contents).

(b) **Lesson modalities and form.**

To achieve this aim, **guided and joint actualization** will be alternated with each other. A moderate tempo is maintained, approximately 15 minutes. The teacher clarifies and demonstrates different acids while writing names and formulas on the chalkboard.

A brief **demonstration** of sulfuric acid in water is made to show the production of electricity and the equation for the reaction is written on the chalkboard (see reaction 1 above).

After this, students are going to **experiment themselves** in groups to **see** if sulfuric and acetic acid can produce electricity (collective actualization). The pupils themselves have to try to **write down** (think about) the reactions of sulfuric and acetic acid. Here the **methodological principle** is deductive with a punctual, linear ordering.

3.4 Controlling the new contents

(a) **Subject content.**

Reaction formulas that the pupils have to write down now are discussed: sulfuric acid; acetic acid.

(b) **Form of the lesson and modalities.**

Joint actualization during which the reaction formulas are discussed. **Question-and-answer** with an exposition on the chalkboard. Teaching tempo is now fast (approximately 5 minutes). Methodological principle is deductive.

3.5 Functionalizing insights

(a) **Subject content.**
Pupils now must master the following subject content:

*write down names and formulas of four acids;
*name three properties of an acid (see reduction);

*write down the reactions of the following acids dissolved in water: HCl; HNO_3; CH_3COOH; H_2SO_4 and H_2CO_3.

(b) **Lesson modalities and form.**

Self-actualization by the pupils who now must individually transfer (apply) the theme. Teacher assesses and offers individual help. Tempo is fairly fast, only 9 minutes. Methodological principle is deductive with punctual, linear ordering.

Example 2: Mathematics
Subject: Algebraic solution of linear equations with two unknowns.
Grade: 10th grade
Duration: 35 minutes

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1. FIRST PHASE OF DESIGNING THE LESSON

1.1 Reducing subject content

1.1.1 Analysis of subject content

* Two equations with two unknowns:

```
    X + Y = 14
    X - Y =  4
    ----------
* 2X =     18    Eliminate Y: new knowledge
   X =  9       Solve for X: foreknowledge
* 9 + Y = 14    Substitute X: foreknowledge
   Y = 14 - 9   Solve for Y: foreknowledge
     = 5
```

1.1.2 Classification of subject content

(a) **Subject terms/concepts.**

* X + Y = 14 Equation with two unknowns.
* Elimination.

(b) **Relations.**

Relations between **one equation** with **one unknown** and **two equations** with **two unknowns.**

$$\begin{aligned} X + Y &= 14 \\ X - Y &= 4 \\ 2X &= 18 \end{aligned}$$

(c) **Proficiencies/skills/techniques.**

* **General procedure** that is followed by elimination: eliminate one unknown; in doing so, one equation with one unknown can be solved.
* **Algorithm:** this solution is contained in one of the given formulas in order to determine the other unknown.

1.2 Learning aims

*The pupils must be able to identify two equations with two unknowns.
*The pupils themselves must be able to solve two equations with two unknowns by **elimination.**

2. SECOND PHASE OF DESIGNING THE LESSON (Aims of the course of the lesson)

2.1 Actualizing foreknowledge

* $2X = 10$
  $X = 5$
* $5 + Y = 14$
  $Y = 14 - 5$ (=9)

2.2 Stating and formulating the problem

What is unknown in the following equations?

$X + Y = 14$
$X - Y = 4$ (ans. X and Y)

Can we solve this? How?

What is the difference between

$2X = 10$ and $X + Y = 14$? (ans. one and two unknowns)

2.3 Exposing the new

$$X + Y = 14$$
$$X - Y = 4$$

Has anyone a plan?

Eliminate Y. How? Subtraction.

$$2X = 18$$
$$X = 9$$

Is our problem solved? No. Why not? We must also determine Y. How will we determine Y? Substitute $X = 9$ in any of the given equations.

$$9 + Y = 14$$
$$Y = 14 - 9$$
$$Y = 5$$

2.4 Controlling the new

Let the pupils now first eliminate X and then determine Y.

(1) $X + Y = 14$
(2) $X - Y = 4$

(1) - (2) $= 2Y = 10$
$Y = 5$

Substitute $Y = 5$ in (2)
$X - 5 = 4$
$X = 9$

One pupil at chalkboard, the rest use their workbooks. Move through the classroom and see what the pupils are doing.

2.5 Functionalizing

(a) $X - Y = 14$ or $X - Y - 14 = 0$
$X + Y = -4$ $X + Y + 4 = 0$

$2X = 10 \quad (X = 5)$ $2X - 10 = 0 \quad (X = 5)$

$5 + Y = -4, \quad Y = -9$

(b) **(1)** 3X - 2Y = 5
(2) 2X + 3Y = 12

(1) x 3 : 9X - 6Y = 15 **(3)**
(2) x 2 : 4X + 6Y = 24 **(4)**

(3) + **(4)** : 13X = 39 X = 3

Substitute X = 3 in **(1)**
3 x (3) - 2Y = 5
- 2Y = 5 - 9 - 2Y = - 4 Y = 2

3. THIRD PHASE OF DESIGNING THE LESSON (Lesson modalities and form)

3.1 Actualizing foreknowledge

Didactic ground forms: example, conversation
Methodological and ordering principles: deductive, linear
Teaching methods: question-and-answer
Modes of learning: remembering, reviewing and practicing known insights
Principles of actualization: guided activity and individualization
Teaching aids: diagramming on chalkboard
Time: 6 minutes

3.2 Stating and formulating the problem

Didactic ground forms: example, conversation
Methodological and ordering principles: inductive and deductive; spiral
Teaching methods: question-and-answer
Modes of learning: sensing and perceiving
Principles of actualization: guided- and self-activity
Teaching aids: chalkboard
Time: 5 minutes

3.3 Exposing the new

Didactic ground forms: example, conversation
Methodological and ordering principles: inductive; linear
Teaching methods: explanation, question-and-answer

Modes of learning: perceiving and thinking
Actualization principles: guided activity and slow tempo
Teaching aids: chalkboard
Time: 10 minutes

3.4 Controlling the new

Didactic ground forms: assignment, example
Methodological and ordering principles: deductive; linear
Teaching methods: question-and-answer (i.e., check, supervise)
Modes of learning: perceiving, thinking, practicing (following example)
Principles of actualization: guided and self-activity. Guided tempo
Teaching aids: chalkboard, workbook
Time: 6 minutes

3.5 Functionalizing

Didactic ground forms: assignment
Methodological and ordering principles: deductive, punctual, concentric
Teaching methods: textbook exercises
Modes of learning: thinking and remembering
Principles of actualization: self-actualization and own individualized tempo
Teaching aids: textbook, exercise book
Time: 8 minutes

[I did not translate a Biology lesson on the cyclical light reaction of photosynthesis for 12th graders or a 10th grade lesson on Biblical knowledge dealing with the magnitude and structure of the bible.]