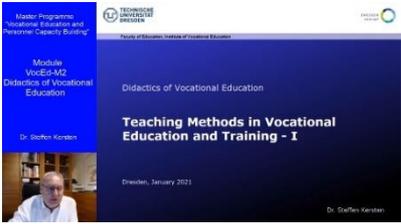
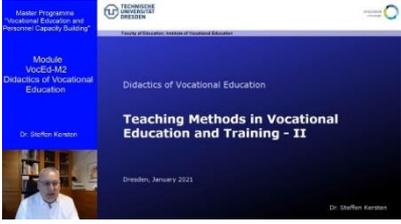


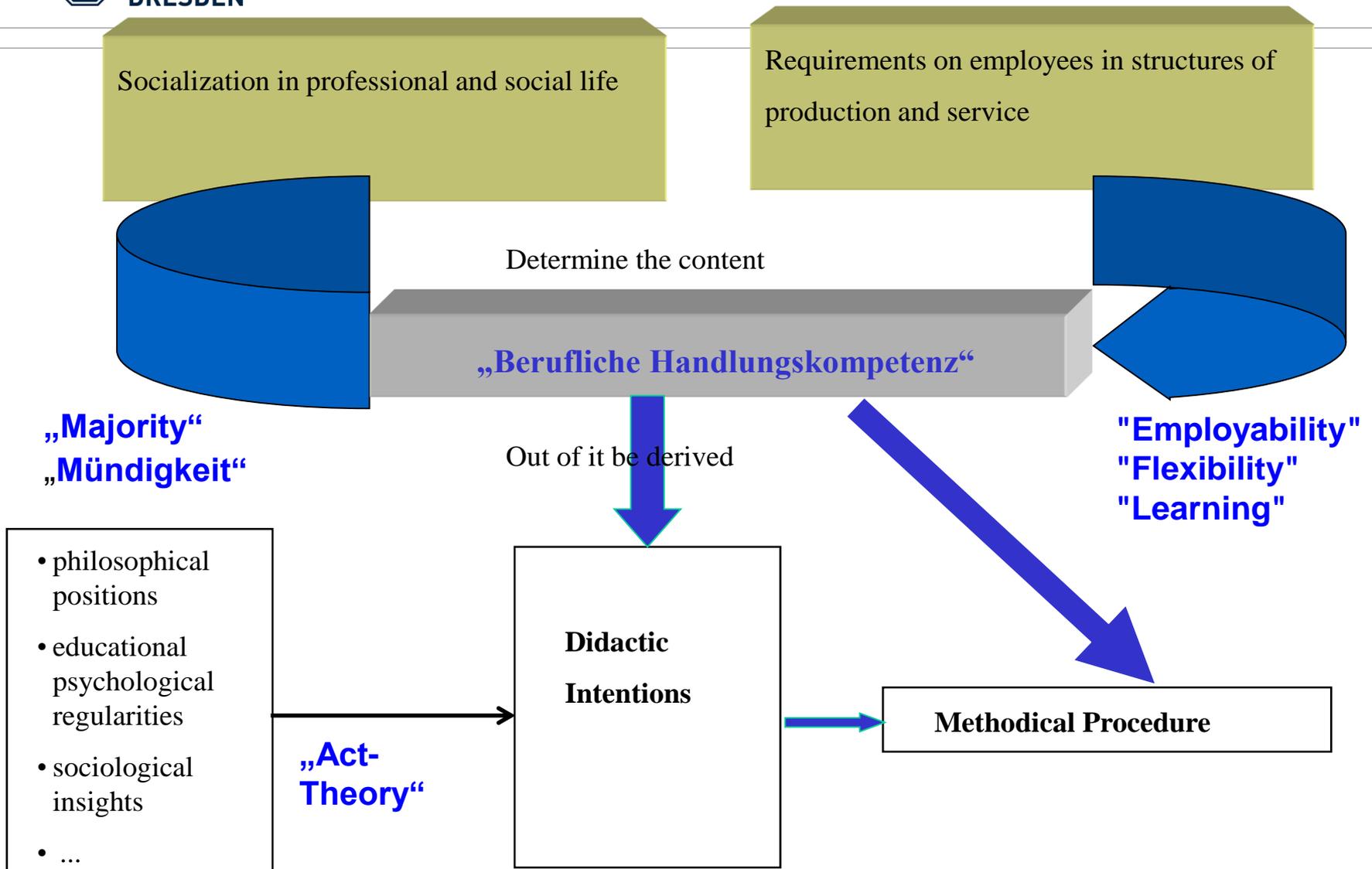
Didactics of Vocational Education

Teaching Methods in Vocational Education and Training - I

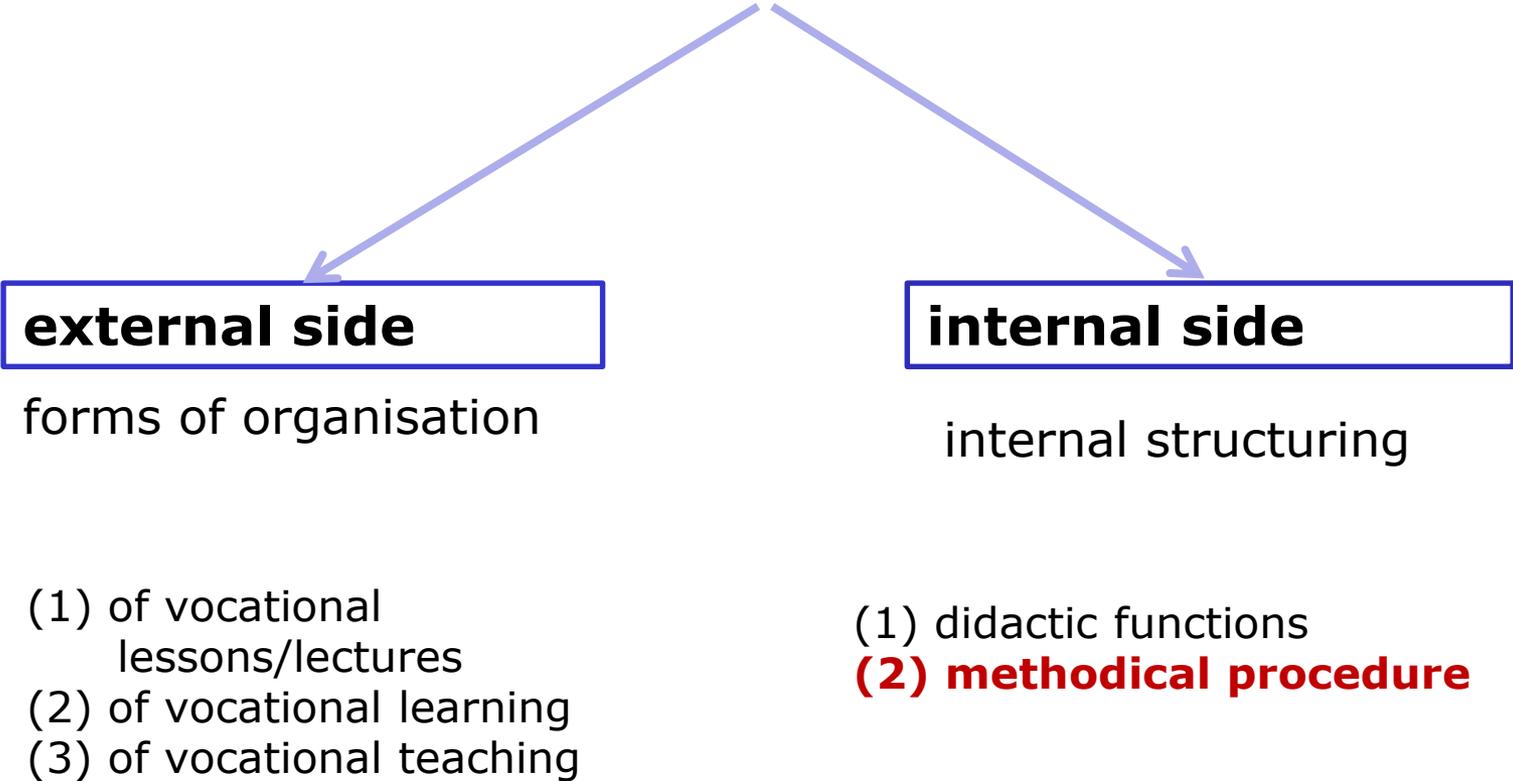
Dresden, April 2022

Prof. Dr. Steffen Kersten

Video-Lecture	Relevant sections in the study material	Exercises	Relevant exam tasks
 <p>Cognitive teaching methods (66 min)</p>	<p>Chapter 5 p. 51 - 57</p>	<ul style="list-style-type: none"> - Develop an own example for one path of cognition! 	<ul style="list-style-type: none"> - Explicate the term “Teaching method”! - Draw up a lesson plan using a path of cognition! - Which factors do you have to consider, when you choose a path of cognition for your lesson?
 <p>Logical basics of cognitive learning (56 min)</p>		<ul style="list-style-type: none"> - Develop your own example of evidence or falsification! 	
 <p>Didactic functions -orientation- (70 min)</p>	<p>Chapter 5 p. 42 - 47</p>	<ul style="list-style-type: none"> - Formulate 3 cognitive learning goals at different levels of the learning goal taxonomy according to Benjamin BLOOM! 	<ul style="list-style-type: none"> - Point out the structuring of vocational lessons by didactic functions! - Explain the relationship between stages of learning acts, didactic intentions and didactic functions! - Describe ways to prepare the learner cognitively, emotionally and motorically for the learning activities! - Why is the holistic orientation so important in vocational training!



Didactic-methodical design of vocational education



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graph TD; A[Didactic-methodical design of vocational education] --> B[external side]; A --> C[internal side];
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external side

forms of organisation

- (1) of vocational lessons/lectures
- (2) of vocational learning
- (3) of vocational teaching

internal side

internal structuring

- (1) didactic functions
- (2) methodical procedure**

“System of rules, which defines classes of possible operational systems, which lead from certain starting conditions to a definite objective.”

(Klaus, G; Buhr, M: Philosophisches Wörterbuch Bd.2. Leipzig 1996, S.717)

“Method, therefore, is a logical structured step or sequence of operations of actions to achieve a definite objective.... Method is defined by the logic of the subject and the structure of the subject of its object and its contents respectively.”

(Klingberg, L.: Einführung in die allgemeine Didaktik. 1974, S.279f)

“Teaching methods are these forms and procedures through and with which teachers and students acquire their surrounding natural and social reality under institutionalized conditions.”

(Meyer, H.: Unterrichtsmethoden Theorieband. Frankfurt a.M. 1987, S.45)

The Method Aspect in a Broadly Interpreted Method Concept

Method aspect	Examples
Objective aspect (aimed at achievement characteristics and behavioral characteristics of personality)	Methods for the development of skills, attitudes and beliefs
Epistemological aspect	Reductive and deductive methods, historic-genetic approach
Aspect of the didactic function within the process of imparting and acquisition	Methods of introduction, consolidation, practice, control
Aspect of the interaction of pedagogical guidance by the teacher and self-activity by the learner	Methods of lecturing, demonstration, teaching conversation, independent work of learners
Aspect of the use of specific teaching aids	Methods for the work with lecture books, programmed instruction aids

By **teaching method** we describe a

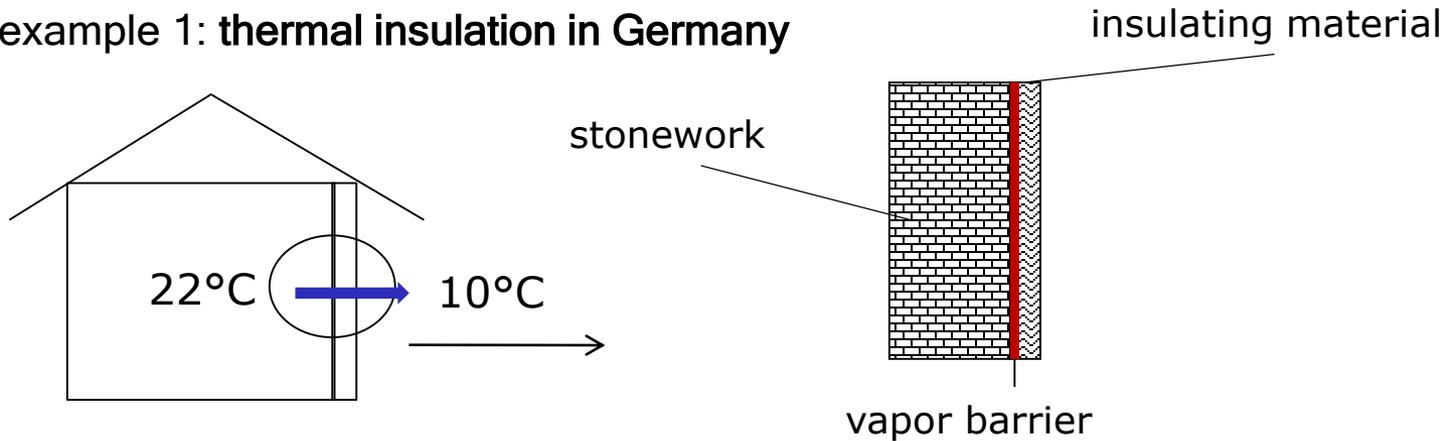
system of act orientations by the teacher to initiate learning acts

with the aim of shaping personality traits,

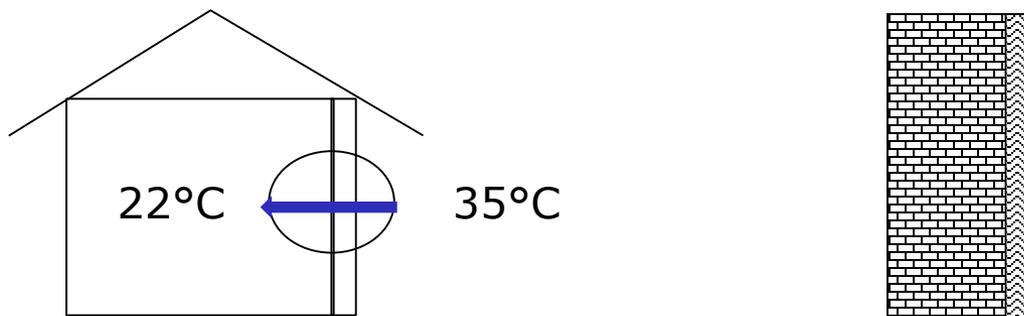
which are aimed at achieving competence of action.
(in a defined area of action)

Thermal insulation

example 1: thermal insulation in Germany



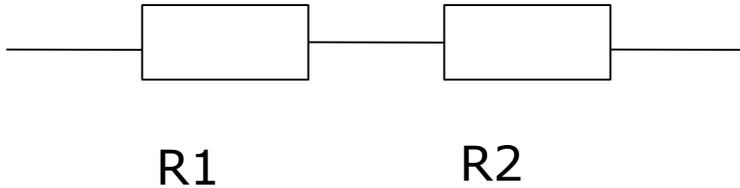
example 1: thermal insulation in Bangkok



Vapor barriers have to be put on the warm side of the insulating material.

Example for inductive method

Subject: serial connection of resistances



measuring of resistances
(measuring of U-voltage and I-current)

$$(R_{\text{tot}} = \frac{U_{\text{ges.}}}{I})$$

R_1	R_2	$R_{\text{tot.}}$
10	30	40
20	40	60
30	50	80
100	10	110

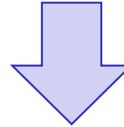


generalisation

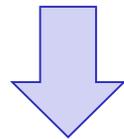
$$\underline{R_1 + R_2 = R_{\text{tot.}}}$$

(designations in Ohm)

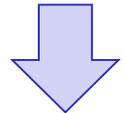
Analysis of several facts which are supposed to have a common regularity



Emphasizing similar features in all facts.
Between the features of a fact are essential connections



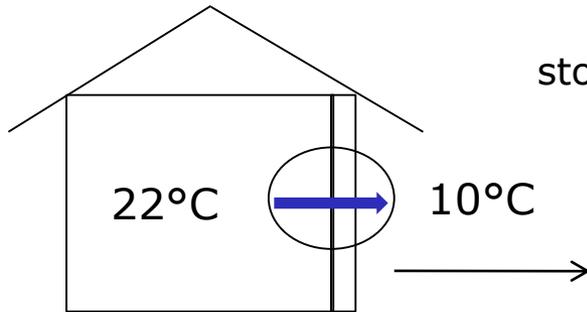
Formulating the realization, that in all examined facts each feature exists because of the other one.



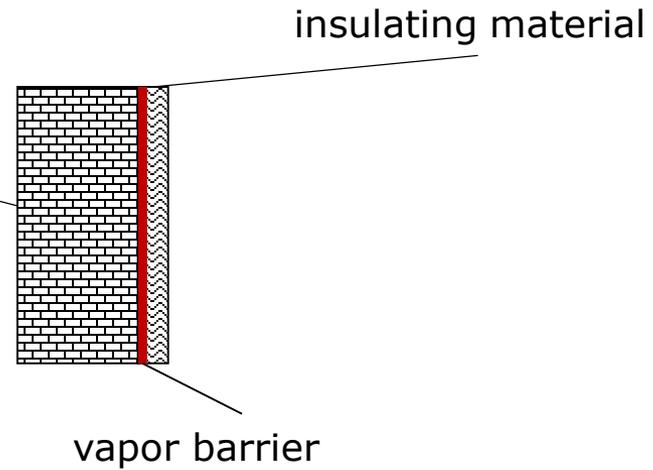
Transferring this realization on all facts of the same type under the same conditions that is generalizing the relations between the features through induction.

Example for deductive method

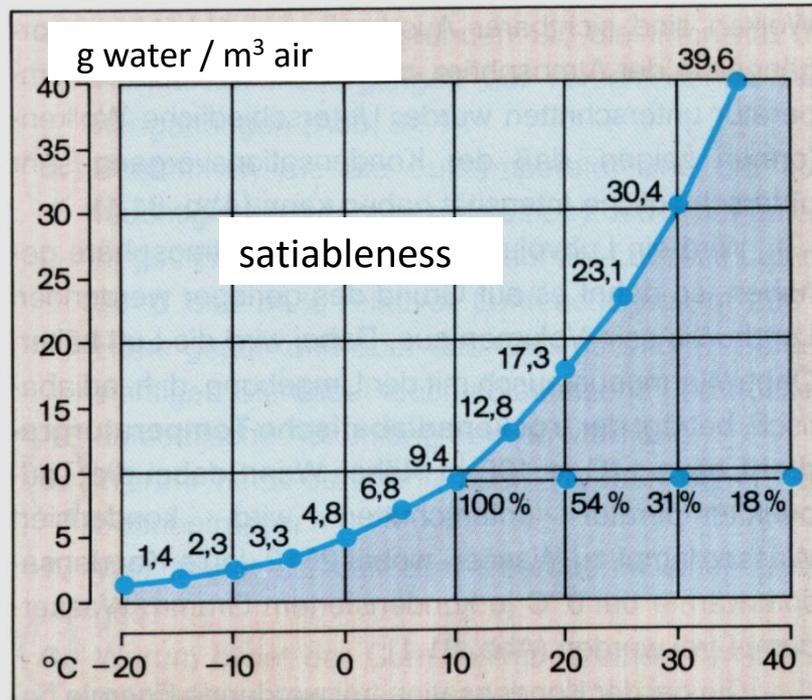
Thermal insulation



stonework

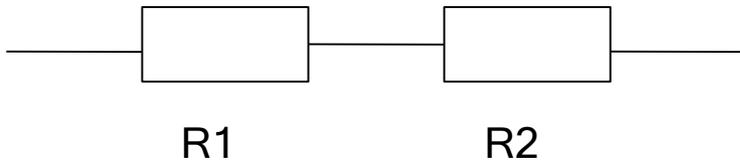


Why the Vapor barriers have to put on the warm side of the insulating material?

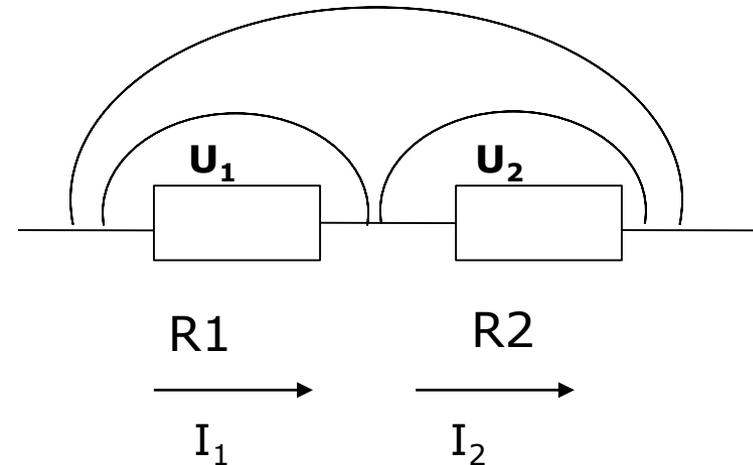


Example for deductive method

Subject: serial connection of resistances



advisement



pre-conditions:
laws after Kirchhoff
law after Ohm

$$U_{tot.} = U_1 + U_2$$

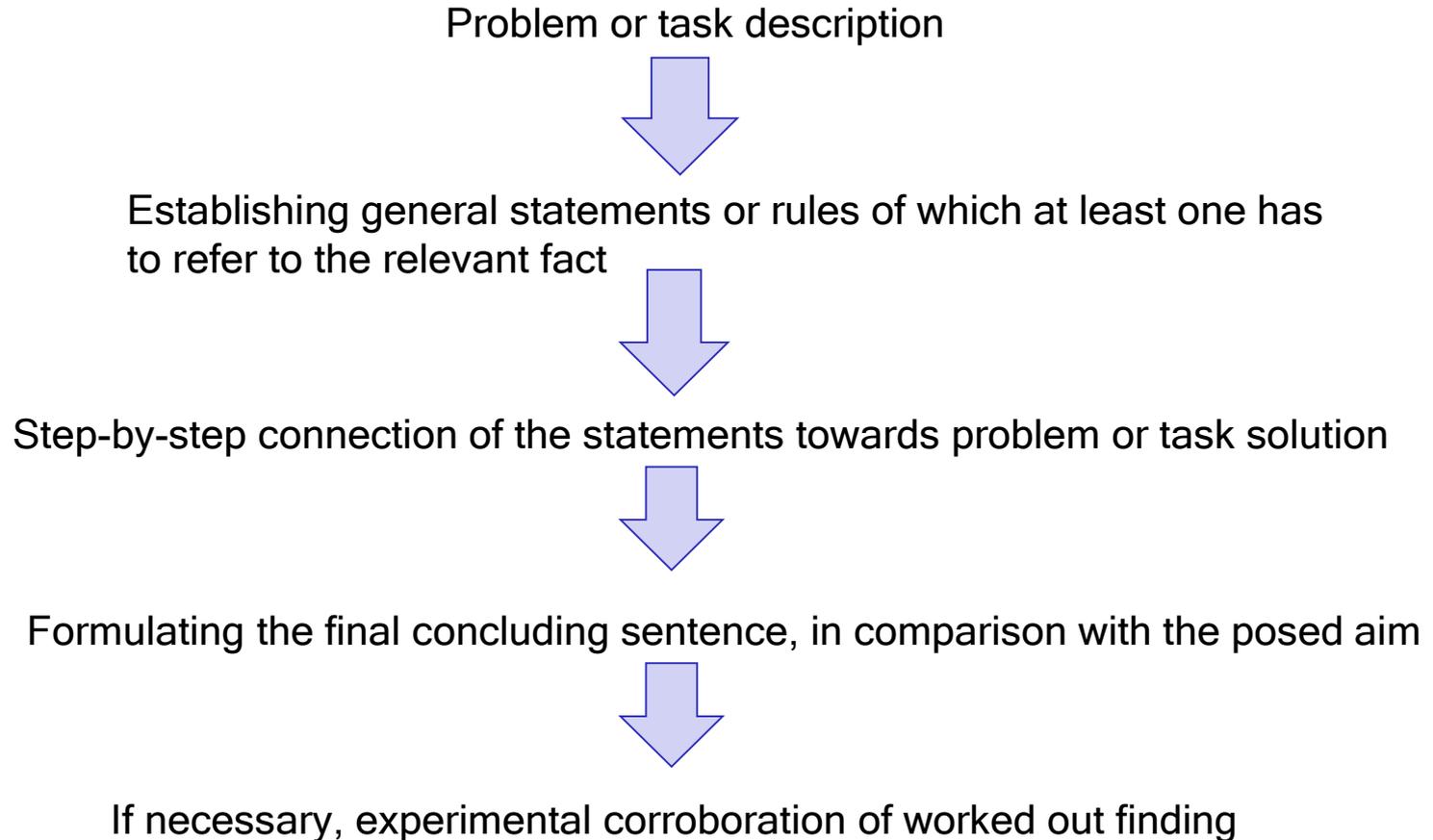
$$I_{tot.} = I_1 = I_2$$

$$R_{tot.} = \frac{U_{tot.}}{I_{tot.}} = \frac{U_{tot.}}{I} = \frac{U_1 + U_2}{I}$$

$$R_{tot.} = \frac{U_1}{I} + \frac{U_2}{I}$$

$$R_{tot.} = R_1 + R_2$$

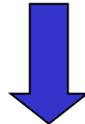
$$\underline{R_1 + R_2 = R_{tot.}}$$



Example:

Structure of the bacterial cell

Starting from the bacterial cell as a whole, the teacher split the cell under the aspects of **structure and function** in their parts:

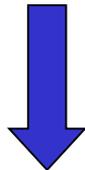


Components: the nucleus-equivalent, plasmids, cytoplasm, cytoplasmic membrane, cell envelope

Example:

Programming a CNC machine

- Manufacturing steps for producing a component
- Characteristics of the individual production steps
- Dependencies between the production steps
- Sequence of manufacturing steps



Transfer the structure into a CNC program

example 1:

A1: In young sourdoughs, the dough is still not evenly interspersed with strong gas developers. (e.g. yeast)

AND

A2: Use of dough that is not evenly interspersed with strong gas developers leads to uneven pore structure in the pastry.

LC: The use of young sourdoughs in bakery production leads to irregular pore structure in the pastry.

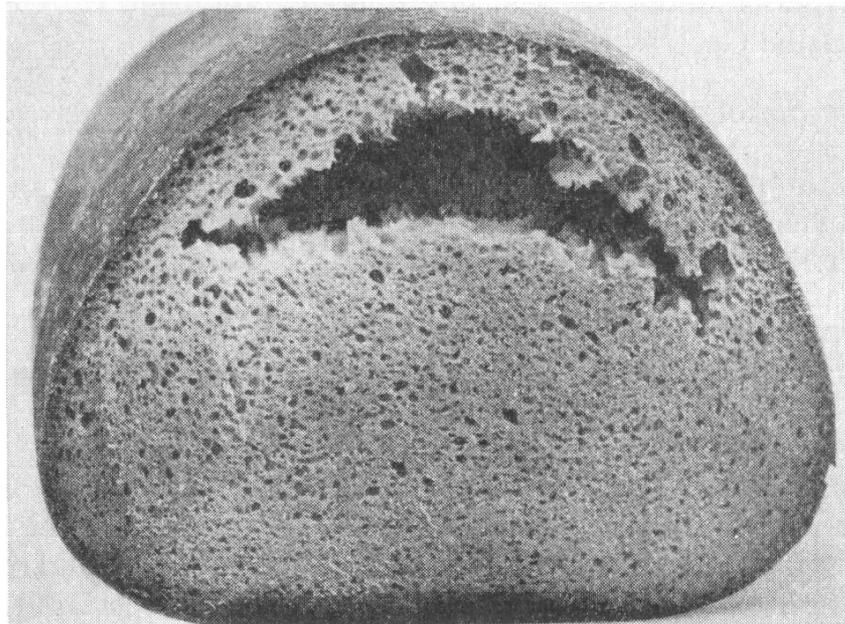
Beispiel 2:

A1: The use of young sourdoughs in bakery production leads to irregular pore structure in the pastry.

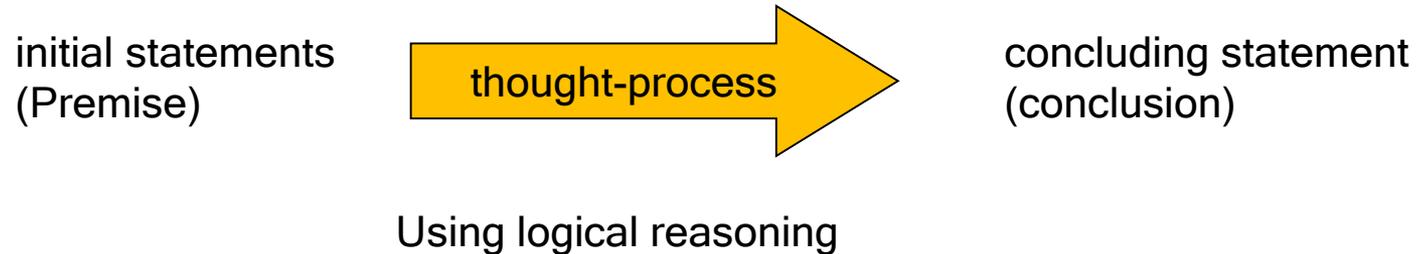
AndUND

A2: Young sourdoughs is used for bread making.

LC: The bread has an irregular pore structure.

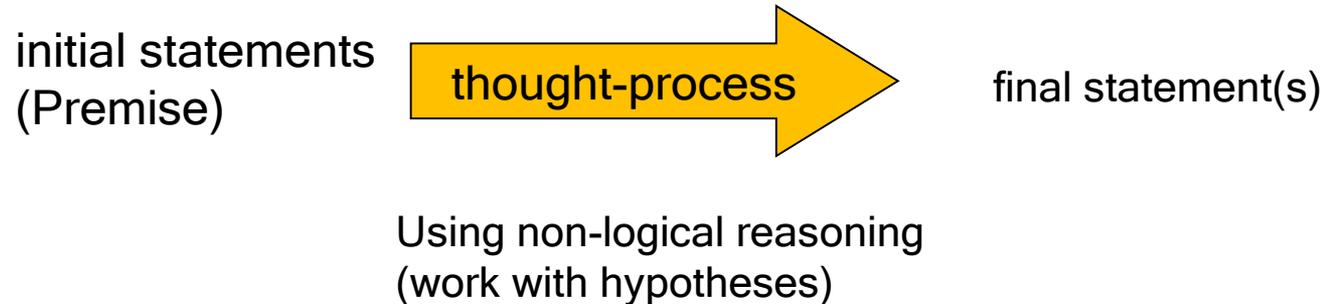


Deduction:



The deductive proceeding in class is characterized by the logically consistent deduction of the realization from true initial statements.

Reduction:



The reductive proceeding in class ist characterized by the development and confirmation of hypotheses.

- Initial point: fusion Chrysler - Fiat
 - example is characteristical for actual economic development

What are the reasons fort these economic concentration processes?

- Discussion about the implications for the company

marketing → fortification of marketing potency, prevention of competition, independent price formation,

production → expedient division of labour, coordination of research, rationalization of capital equipment

capital → self-financing through profit-shifting, financial independence

material → discount, self furnisher

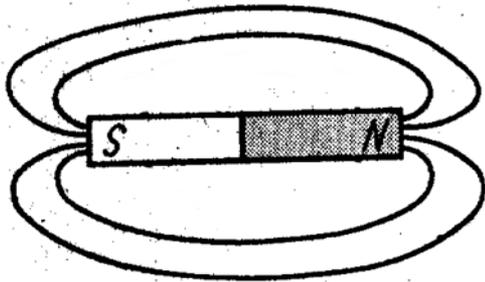
personnel → exchange of experts

- Implication fort he company if it dosn't expand:
danger of competitive capacity

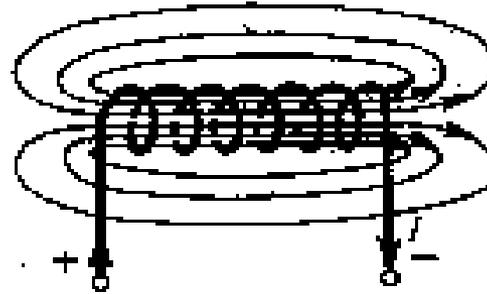
Example for regressiv-reductive method

- processes of economic concentration are necessary for companies to save their international competitive capacity
(hypothesis)
- formation of big corporates, syndicates and cartels

Example for regressiv-reductive method



bar magnet



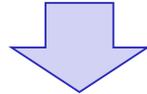
electric current flows
through a spiral inductor

- Inductor has magnetic field only, if electric current flows through it. → directed flow of charge carriers
- Bar magnet has its characteristics on the basis of molecular magnets.

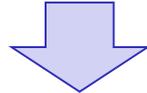
→ What is the reason for magnetism in molecular magnets?

- Basic parts of molecular magnets are iron atoms.
 - Iron atoms have moving electrons in their atom mantle.
 - Through direction of this movement of electrons is a directed flow of charge carriers possible.
 - (Molecular current hypothesis after Ampere)
- common essence of inductor and bar magnet

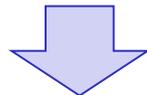
Analysis of a given fact, which is in its appearance unknown to the learner or whose effect has to be traced back to a yet unknown cause.



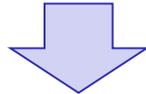
Defining the goal of realization



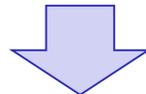
Emphasizing such characteristics which are supposed to be of importance to the establishment of a realization.



Assigning the fact to already known and explained appearances, causal relations, rules



Stating a thesis about the nature, cause, reason of the fact



Explaining the fact by means of the hypothesis.

Carbonating of concrete

initial advisement:

- The hydration of cement in concrete builds calziumhydroxid Ca(OH)_2
- This Ca(OH)_2 is the reason for a high pH-value in concrete (12,6)
- If the pH-value about 9 it isn't possible that corrosion proceeds
→ It isn't possible that core iron rusts in concrete.

But: Marginal core iron in concrete rusts! Why?

- Corrosion is only possible if pH-value lower than 9

hypothesis:

- Through environmental influences the pH-value on the surface of concrete decreases

confirmation of hypothesis:

If the hypothesis is true, than pH-value on the sureface of new concrete is significant greater than the pH-value of older concrete which was caught environmental influences.

test → pH-indicator

results: new concrete 12,6
old concrete 8,3

Hypothesis is confirmed.

Deductive explanation:

The hydration of cement in concrete builds calciumhydroxid



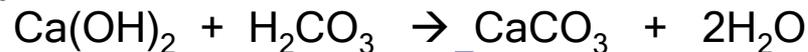
Calciumhydroxid has a pH-value of 12,6.

→ new concrete has a pH-value of 12,6

Carbon dioxide (CO_2) in air react with water to carbonic acid (H_2CO_3).



Calciumhydroxid react with carbonic acid to Calciumcarbonate



Calciumkarbonate has a pH-Value of 8,3



→ Old concrete has on the sureface a pH-value of 8,3

Rust protection is only ensure if the pH-value about 9.

→ It's possible that core iron near by sureface in concrete rusts.

Molecular current hypothesis after Ampere is the initial point.

- Through direction of movement of electrons in the iron atoms is a directed flow of charge carriers generated. This directed flow of iron atoms is the reason for magnetism in molecular magnets.

Confirmation of hypothesis:

If the hypothesis is true then must a disorganisation of the direction of movement of electrons in the iron atoms cause decrease or forfeiture of magnetic field.

How is it possible to discreate the direction of movement of electrons in the iron atoms?

- to knock the bar magnet on a table
- to anneal the bar magnet

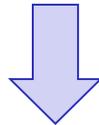
Knocking of the bar magnet causes decrease of magnetic field.

Annealing of the bar magnet causes forfeiture of magnetic field.

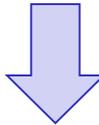
→ Hypothesis is confirmed

The starting conditions are:

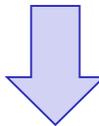
A hypothesis about the nature, cause, reason of a fact



Analysis of the hypothesis



Drawing conclusions from the hypothesis, for example through experiment or observation in reality



In case there is a correspondence between conclusions and reality then the hypothesis can be considered as probably true, otherwise it is wrong

analytic	whole - part
synthetic	part - whole
deductive 1	general - particular
inductive	particular - general
deductive 2	attaining true statements by truthful-logical conclusions
reductive	attaining true statements by non truthful-logical conclusions
genetic	imperfect - perfect
historic	logical - historical
causal	cause - impact

- characteristics of the matter of acquisition
- pedagogical intentions
- pre-conditions of learners
- temporal and spatial conditions

Thank you for your attention!

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<https://wwwpub.zih.tu-dresden.de/~kersten>