



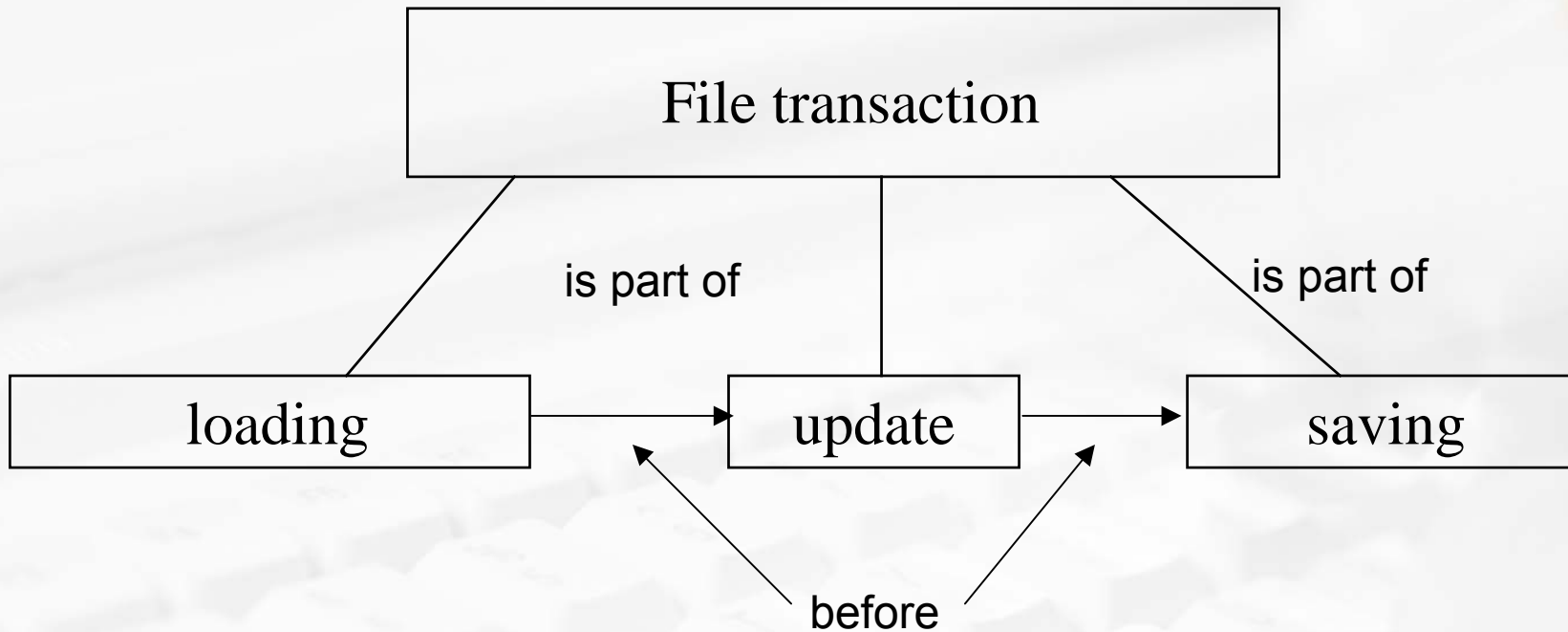
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# Educational Paradigms for digital Services in Universities

**Web-Didactic  
Thesaurus, Ontologies  
Metadata-Model for Learning Objects  
and  
Learning Navigation**

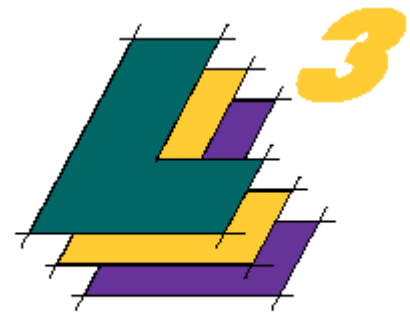
1. Cooperation with librarians (since 1977)
2. ... with specialists in classification
3. ... with specialists in thesaurus
4. ... with specialists in artificial intelligence
5. Founding ISKO 1990 (Vice President)
6. → Web-Didactic as  
Knowledge Organisation  
by working with catchwords (Metadata)

# Thesaurusstructure of learning



Learning units

# Web-didactics problem



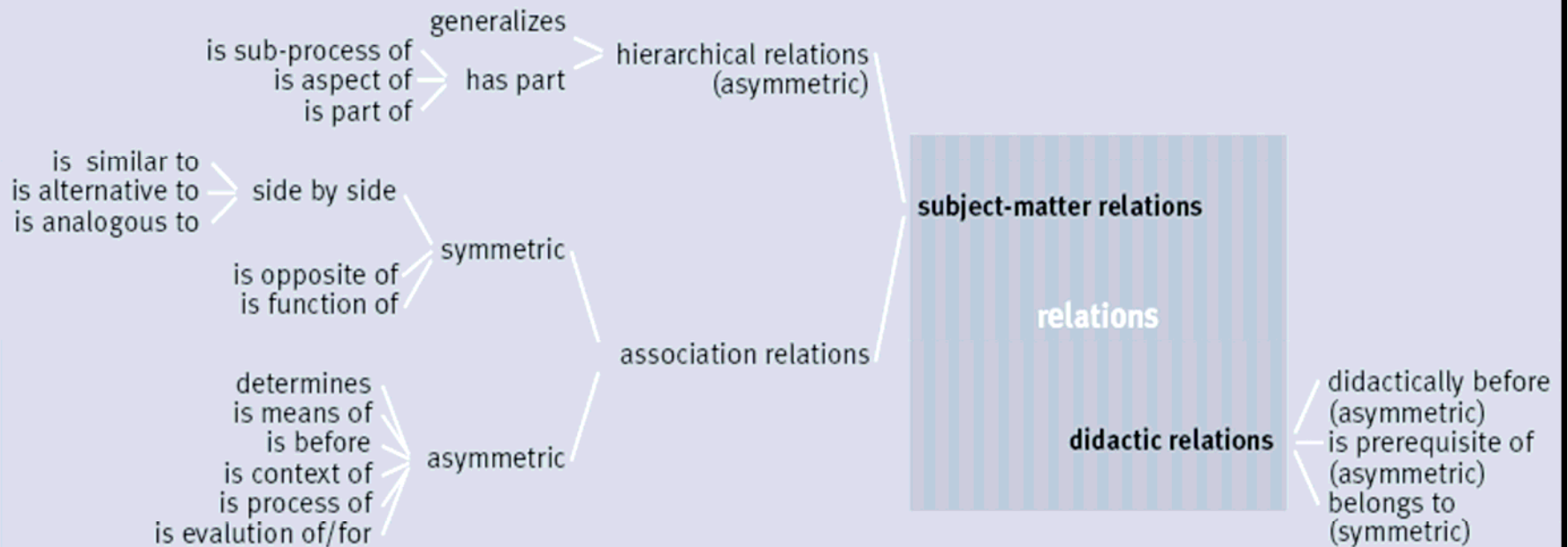
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Didactic action is the transformation of multirelational networks (semantic nets) into the (linear) period of learning

- Multidimensional network → onedimensional time of learning
- Didactic reduction = select one path from a set of many paths
- Offer the alternatives for selection in self organised learning
- Support learners to make an appropriate selection

- **We call the path or route a learner takes through the semantic network (through the material) learning navigation or just navigation. We call the leading navigational viewpoint, its orientation to a relation of the thesaurus, a learning strategy.**
- For example: strategy of analogous learning, of leaning by generalisation and so on

# WD Ontology: Relation Types



## What asks the learner

- Know-where: Where can I find?
- Know-what: What is this, how is it defined or explained
- Know-why: Why is this so as it seems to be?
- Know-How: What can I do with this? How act with this?
- Know-if: What exists? Where can I orientate me?

## Learning Units as sets of Knowledge Units ...

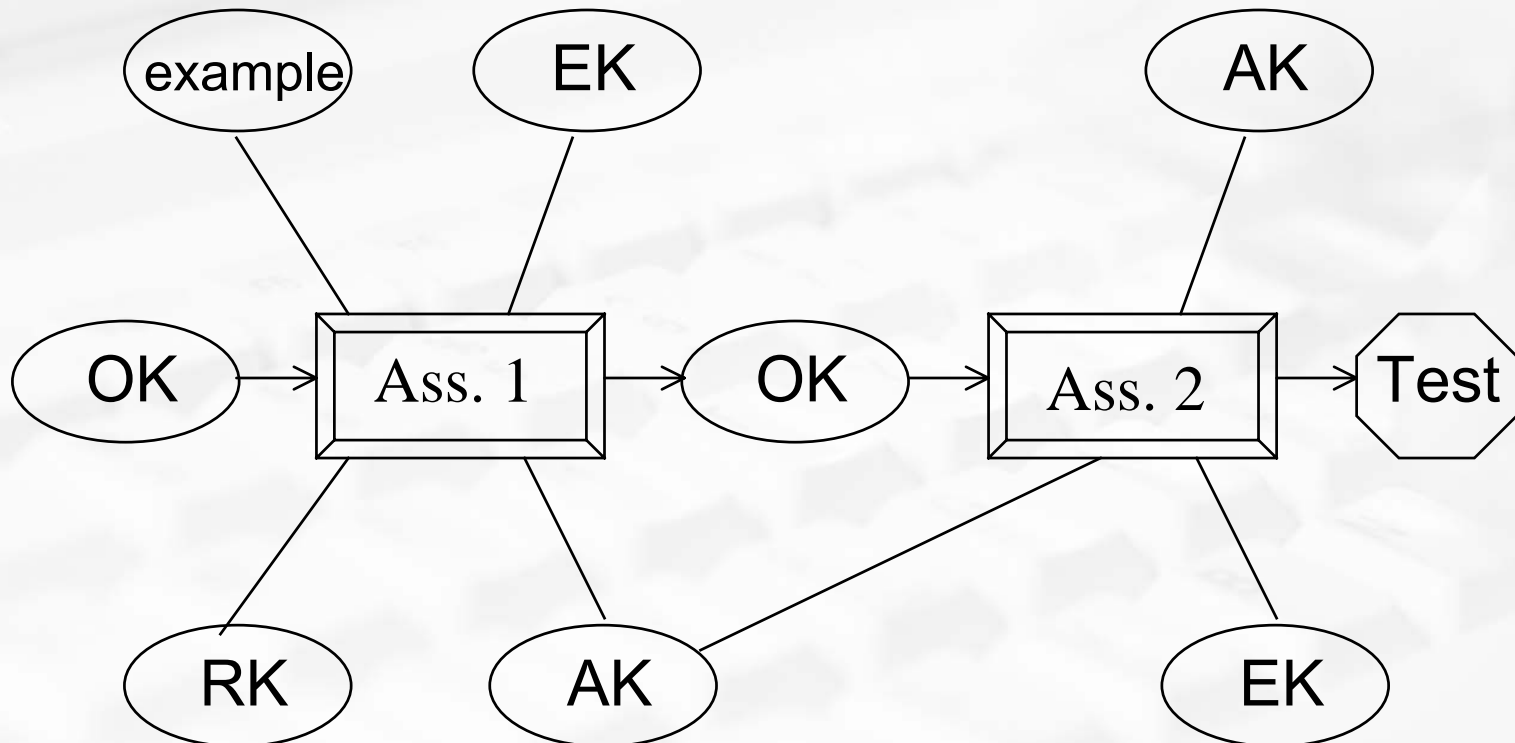
- Actually are nodes in the thesaurus containers for units (learning material) referring to sources where I can find relevant information for self organised Learning
- Learning Units have a micro-structure
  - differentiated by knowledge type, media type, competency type
  - differentiated by information, assignment and cooperation
- at micro-structure level - that means – within a thesaurus-node - we differentiate demands on knowledge navigation
  - theory driven, example driven, action driven, rule driven and so on
  - visual, textual, acoustic, symbolic, iconic oriented and so on
  - and by media type: increasing/decreasing semantic density, acceleration/deceleration of information flow
- within Learning Units, i.e. thesaurus nodes, there is no semantic differentiation. only didactical relations (links) make sense, :
  - ‚belongs to‘ and ‚prerequisite‘





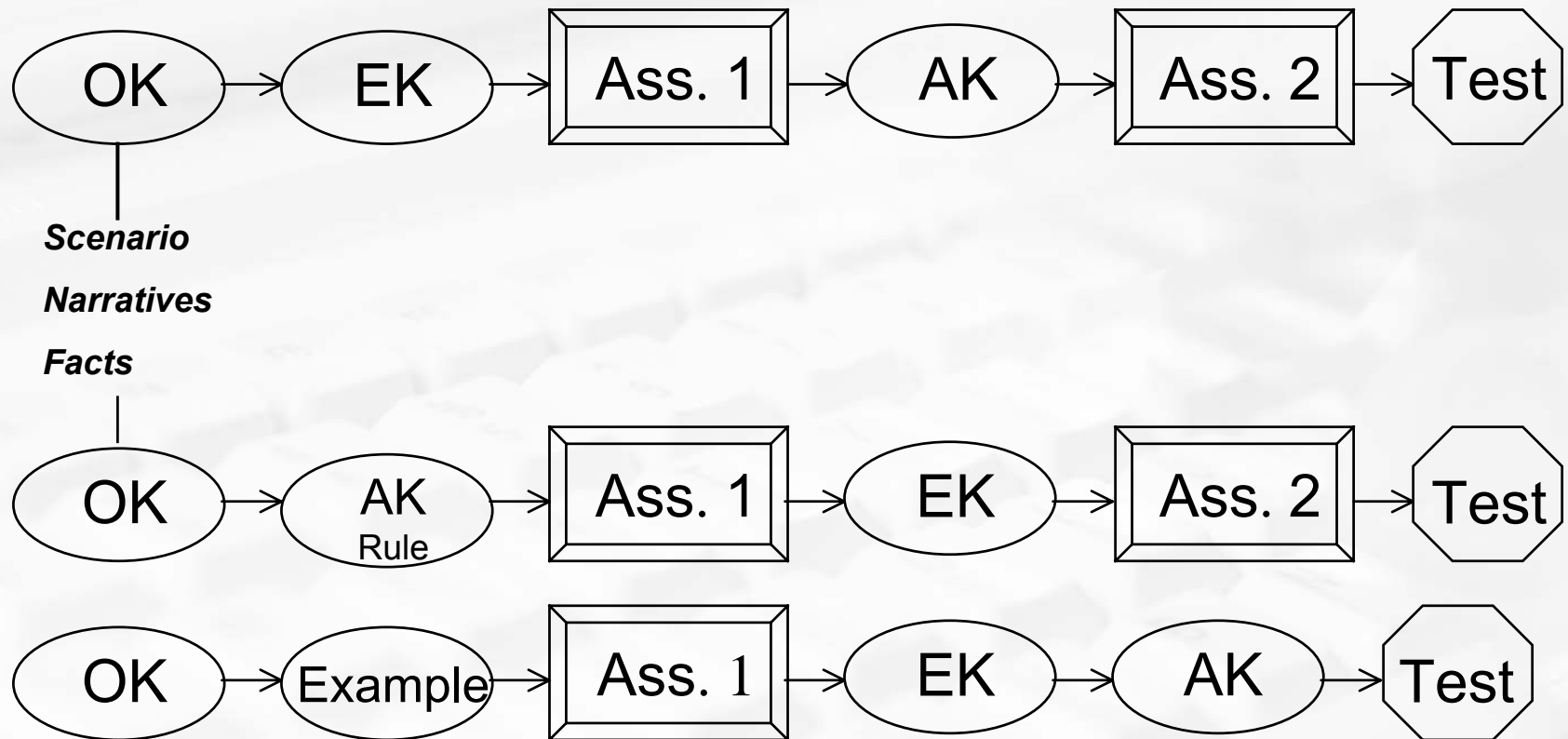
# Assignment oriented Design

- **Micro didactics = Transformation of a knowledge map into learning time – partially linear**



# Expositoric Design

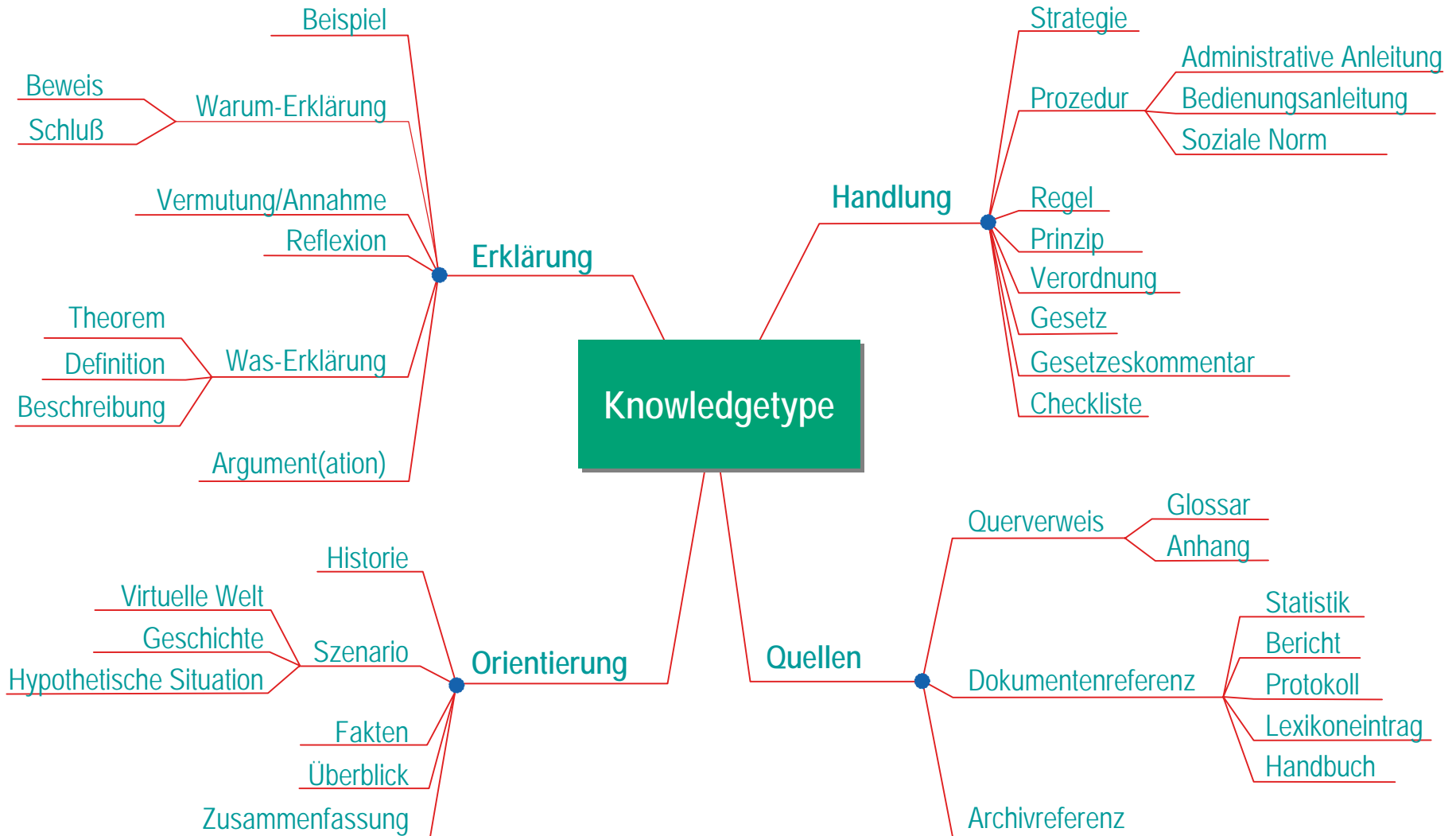
- **Micro didactics = Transformation of a knowledge map into linear learning time**



- 1. Use the relations of thesaurus as learning strategies to navigate from concept to concept, from node to node.**
- 2. Enrich every concept of the thesaurus with different knowledge types – such as Know-why, Know-what, Know-how, Know-where.  
Enrich every concept of the thesaurus with different media – such as video, picture and text.  
Enrich every concept of the thesaurus with different arrangements of cooperative learning – such as brainstorming, ping-pong-writing and so on.**



# Ontologie: Knowledge

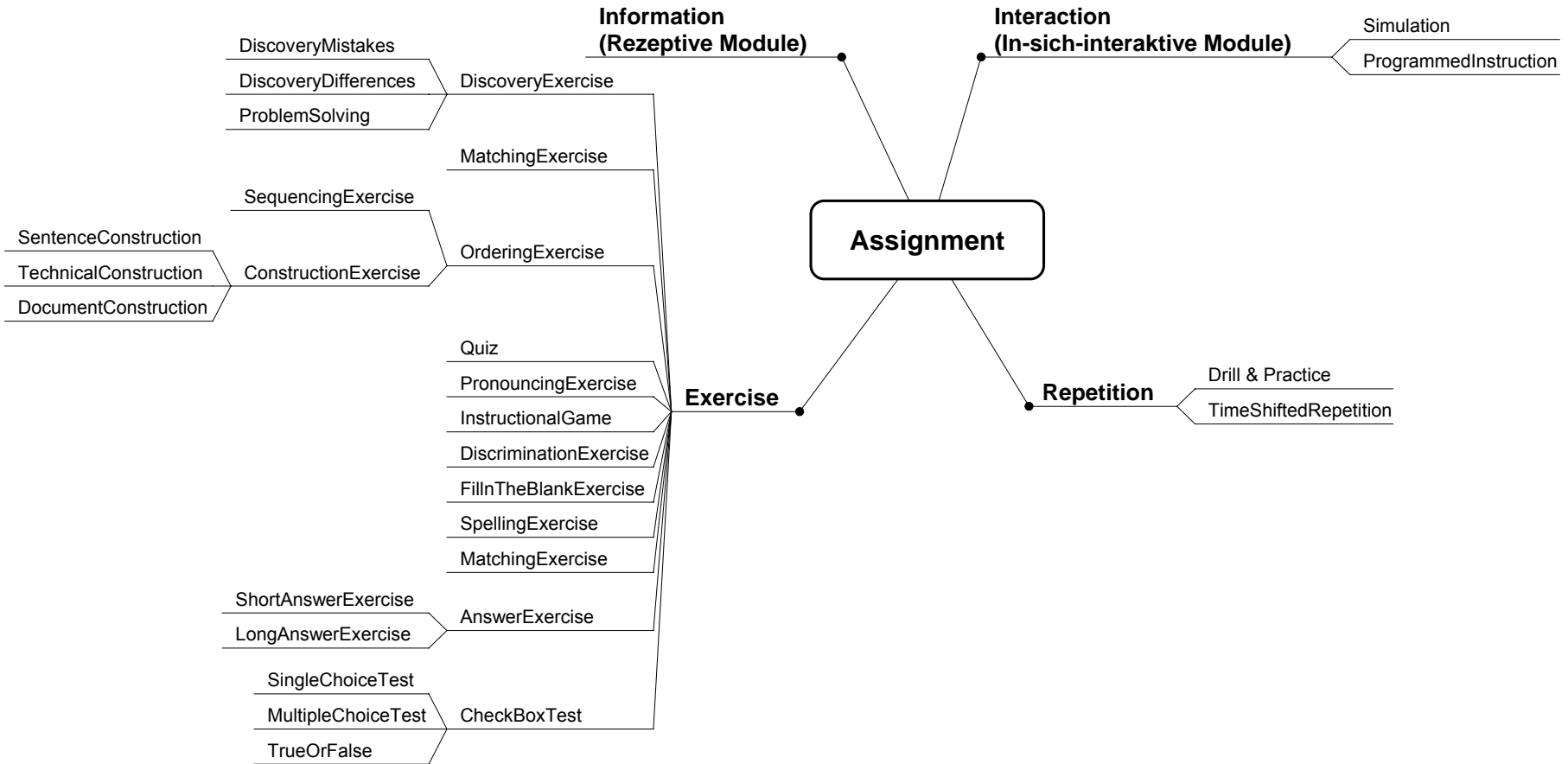


# Didactic matrix of the whole Ontology



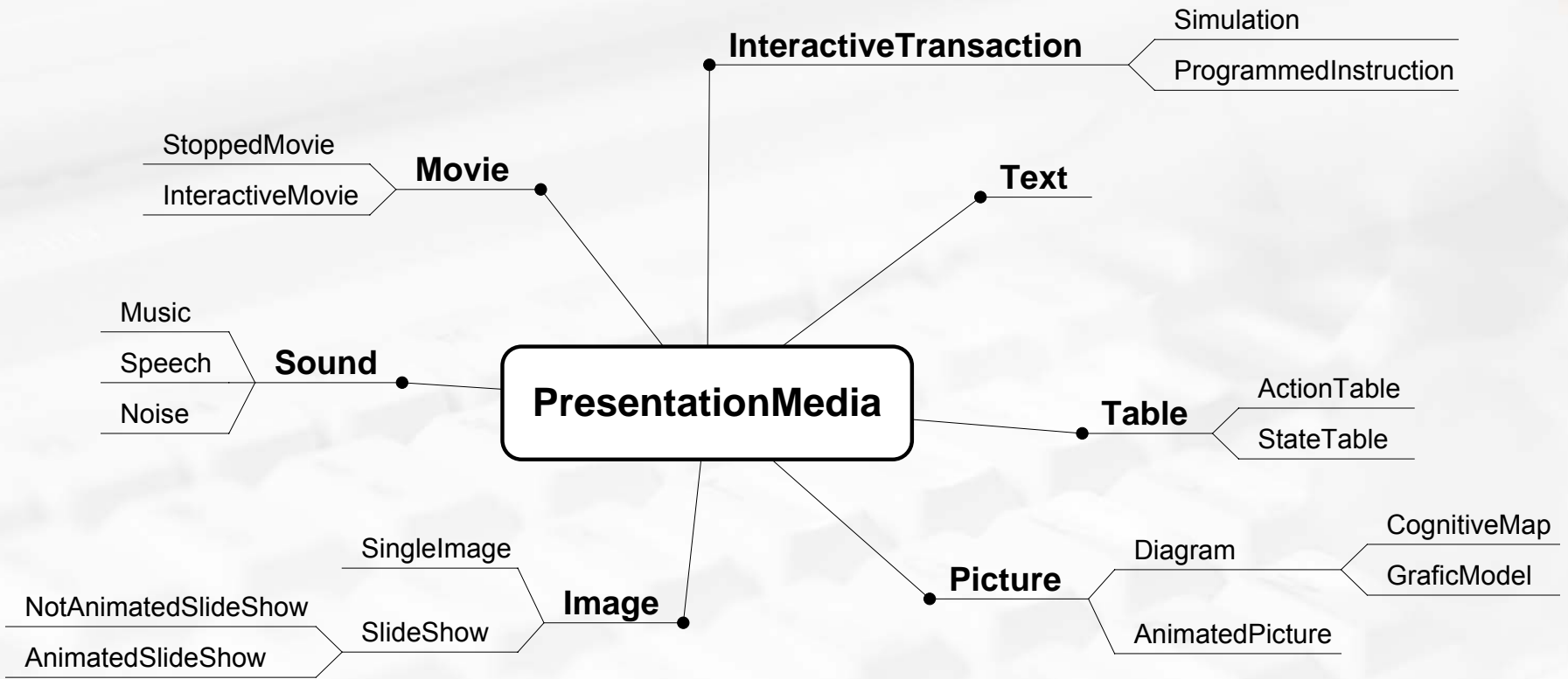
	Receptive knowledge units	Interactive knowledge units	Cooperative knowledge units
<b>Matter-of-fact dimension</b>	Thesaurus (3 or more levels)		
<b>Competency dimension</b>	Bloom Taxonomy (possibly further refined)		
<b>Media dimension</b>	Ontology of receptive media	Ontology of interactive media	Ontology of communication media
<b>Knowledge dimension</b>	Knowledge type Answers to questions	Assignment types Filling of blanks	Types of Cooperation (knowledge communication)
<b>Relational dimension</b>	Matter-of-fact relations	Integration in knowledge units using didactical relations (prerequisite, belongs-to)	Matter-of-fact relations dealing with the topics of the cooperation otherwise didactical relations

# Ontologie: Assignment



# Example of Ontology: Media types

(Metadata typology)





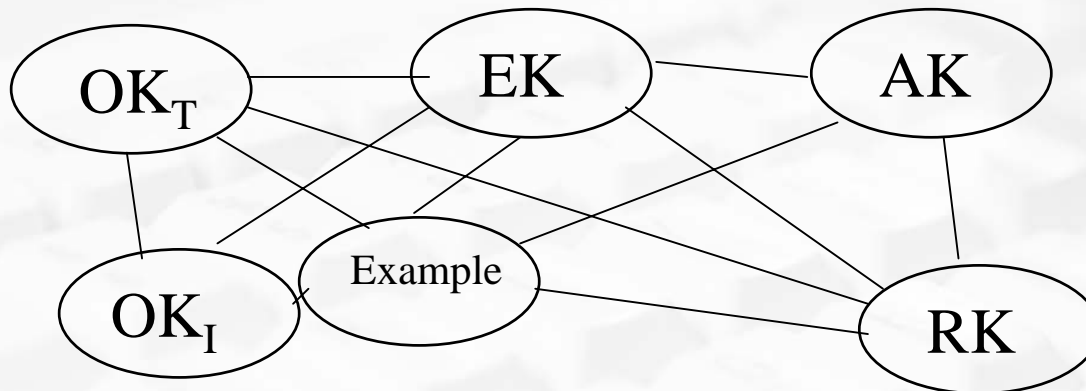
# Microspace of Learning

- In the microspace of learning, i.e. in the space of variation within a theme or subject (catchword) along knowledge type, media type and competency level and along the differentiation of learner activity there is a structural complexity of potentiell 11.445 knowledge units. The number results from the formula:
- $51 \times 22 \times 7 + 27 \times 5 \times 7 + 42 \times 9 \times 7 = 11.445$  (kt x mt x ct)

- Within learning units (micro structure)
  1. Experiential and explorative learning
  2. Task oriented learning – explorative
  3. Theory driven learning – directed
  4. Rule driven learning – directed
  5. Example driven learning – directed
- Five of more than 100 micro strategies
- 800 learning sequencies are not equal

- **Micro didactics = Transformation of a knowledge map into linear learning time**

File transactions



- Between Learning Units (semantic processes)
  1. Deductive learning
  2. Inductive learning
  3. Process oriented learning
  4. Process oriented learning
- Only 4 of more than 20 known macro strategies  
  
(The total number of possible learning options or learning preferences is not known but our concept provides the space for these options)

- 1 General: Basic Information and semantic descriptors
- 2 Characteristics: Attributes of resources
- 3 Lifecycle: Attributes concerning the lifecycle of a resource
- 4 MetaMetadata: Information concerning Metainformation
- 5 Technical: Heading for technical attributes of a resource
- 6 **Educational Use Dependent**: contains educationally relevant attributes of a resource
- 7 Rights Management: Terms of use for a resource
- 8 **Relation**: References of one resource to other resources

# Elements of Educational



- Interactivity Type – refinement by WD
- Learning Resource Type – refinement by WD
- Interactivity Level – usable by WD
- Semantic Density – usable by WD
- Intended End User Role – usable by WD
- Context – usable by WD
- Typical Age Range – usable by WD
- Difficulty (competency) – usable by WD
- Typical Learning Time – usable by WD
- Description – usable by WD
- Language – usable by WD

# Subelemente

- **Interactivity Type:** active, expositive, mixed
- Refine „activ“ for WD:  
receptiv, man-machine-interactiv, cooperativ
- **Learning Resource Type:** exercise, simulation, questionnaire, diagram, figure, graph, index, slide, table, narrative text, exam, experiment, problem, statement, self assessment, lecture
- Refine „exercise“ by WD-Assignment-Types
- Refine „statement“ by WD-Knowledge-Types
- Refine „questionnaire“ by WD-Cooperation-Types
- Amend vocabular concerning media with WD-Ontology of Media-Types

# Elements of Relation

- Item ‚9 Relation‘ should be refined  
LOM uses „Kind“, i. e. the type of relation to other resources:
- IsPartOf, HasPart
  - refinement by WD
- IsVersionOf, HasVersion
  - usable by WD
- IsFormatOf, HasFormat
  - usable by WD
- References, IsReferencedBy
  - refinement by WD
- tree of associative relations
- IsBasedOn, IsBasisFor
  - usable by WD
- Requires, IsRequiredBy
  - usable by WD



Current considerations result in:

- The whole WD-ontology can be used as refinement of the LOM specification
- All activity structures in IMS-LD could be based on such ontology and on WD-set of metadata
- Therefore let's have a look at methods, plays, acts and role parts

# learning design

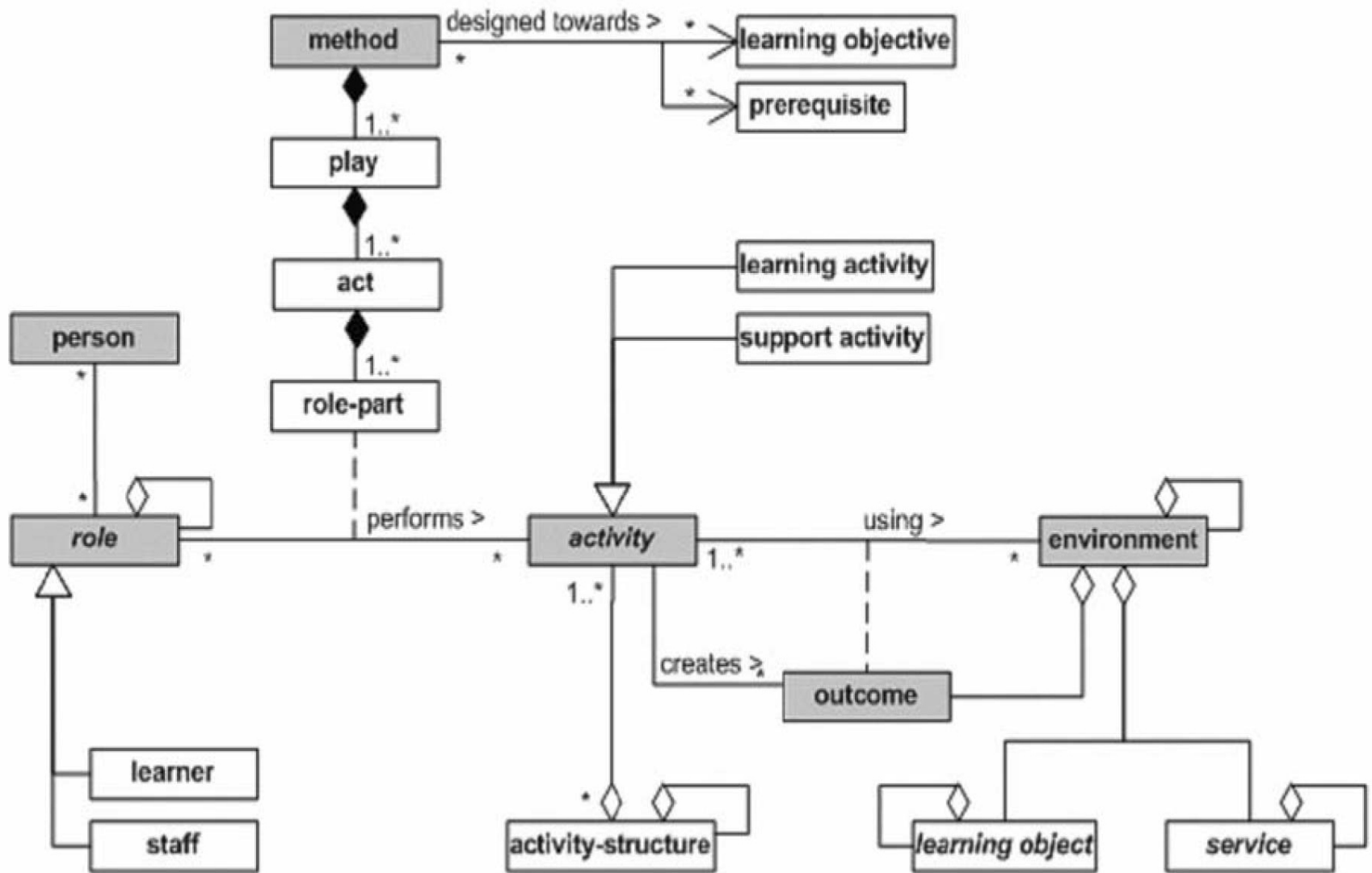


Figure 3.1 - Conceptual model of Level A.



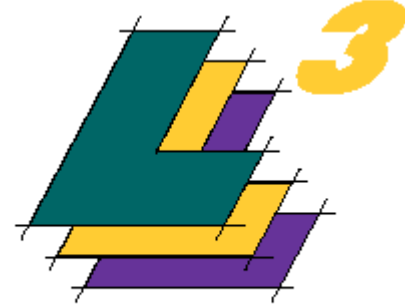
# IMS-LD and learning navigation

- **Method** (Methodik) governs the running of a Unit-of-Learning (Lernumgebung), has
- One or more **Play(s)** – logically independent – like sub courses, they have
- One or more **acts** (WD: learning units) described by roles & role parts (Partituren)
- **Role** ↔ **role parts** define micro strategies
- **Activities** are performed following micro strategies within the environment of learning

- The problem is, that methods govern the whole Unit-of-Learning, all plays and all acts
- If the method is deductive learning, everything must be learned deductively
- Learners have only one choice. The WD flexibility seems to be lost when integrated in LD
- Solution: WD must be the method controlling LD something like an universal method
- ***Activities, roles and role parts*** must be defined as micro strategies

- Acts must be designed as learning units
- Plays are courses as sets of learning units structured by semantic relations
- Acts contain knowledge units structured by didactical relations
- WD is the method controlling the choicibility of all strategies of learning navigation
- **Activity structures** are the patterns of micro strategies

# IMS-LD and Web-Didactics

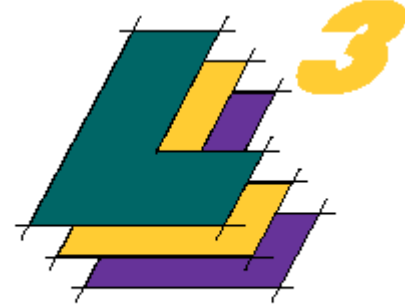


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## Current statements to be discussed

- WD and IMS-LD are compatible!
  - Acts control micro structure of learning (micro strategies)
  - Plays control macro structure of learning (macro strategies)
- It is possible to describe learning strategies by using the concepts of
  - Role parts, activities and activity-structures with
  - Conditions, properties and notifications
- WD and IMS-LD are really compatible –
  - Method is one and only one for the learning design
  - Web-didactics must be defined as a method containing all strategies
  - Allowing to choose macro structures in beginning of plays
  - And allowing to choose micro structures in beginning of acts

# Philosophy of Web-Didactics



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**Central issue is knowledge organisation using Metadata to control learning strategies, interactive learning and cooperative learning**

- Learning strategies are independent from content and work
  - by named links (semantic relations): complex knowledgeorganisation
  - they support reuse, adaptivity and personalisation of knowledge
- Cooperative and distributed learning structures are included as
- knowledge units defining micro strategies:
  - structured scenarios and structured communication like ....
  - Snapchat, open space conference in chat, ping-pong-writing a.m.m.
- web-didactics is a new paradigm:
  - Learning environment is arranged by author-teacher
  - Learning navigation is chosen by learner, the auto-didactic expert