IMS Learning Design:
First-hand Experience in Creating Courses

[a] <learning-activity> as core concept

[b] Experimental use in courses at university

**Lecture
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Welcome,

I'm very happy to be invited and I'll take the opportunity for a short introduction to IMS Learning Design. When I was asked to give this lecture in English, I spontaneously made up this title: "First-hand Experience".

Later, I considered, this title has two aspects:
- First, as you see as part b – it's about "first-hand experience" in using IMS Learning Design in courses at our university. This is what I wanted to talk about initially.
- Secondly, as I thought of during preparation – "first-hand experience" can be taken as a metaphor for the key concept in IMS Learning Design – which are "learning activities". In my opinion, the concept of learning and support activities are very unique to IMS Learning Design, and activity based learning means first hand experience for the learner.

So I'll talk about both aspects: about learning activities first and secondly about our experimental use at university.

Preliminaries

- ### IMS Learning Design
  - **Version 1.0 Final Specification**   **published Feb 2003**
    IMS Global Learning Consortium, Inc.

    The objective of the Learning Design Specification is to provide a containment framework of elements that can describe any design of a teaching-learning process in a formal way.

IMS Learning Design was published in February 2003. It was developed by the IMS Global Learning Consortium; and it might become standard – either de-facto-standard via SCORM™ or an official standard via IEEE.

The specification IMS Learning Design is based on the Educational Modelling Language EML, which was developed at the Open University in the Netherlands. The Educational Modelling Language EML had a certain impact on the discussion on conceptual modeling of educational content. There's Rob Koper to be named, who was the main author in the development of both – EML and IMS Learning Design.

At IMS Global the Learning Design Workgroup integrated EML with basic concepts of other IMS specifications – they mainly integrated IMS Learning Design into IMS Content Packaging.
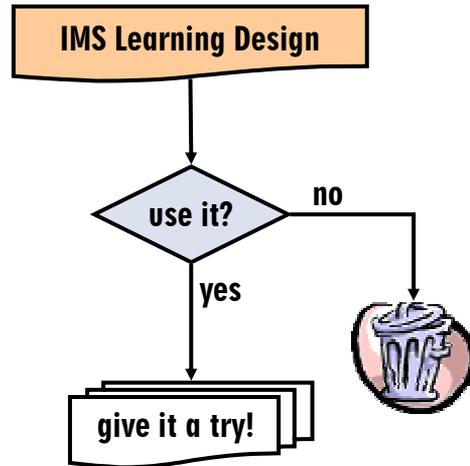
Well, if you read the objective on the slide – you will notice, this is a very comprehensive objective.

- It's about a containment framework,
- for any design,
- in a formal way.

Preliminaries

■ **IMS Learning Design might be**

- **underspecified**
- **far too complex**
- **not very sophisticated**
- **not a central issue**

■ **SO ...**

IMS Learning Design

use it? → no

yes

give it a try!

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When we now focus on IMS Learning Design as a standard, we can analyze this specification and may come to a judgment. We can make a critical judgment and find any of the following facets:

IMS Learning Design might be

- underspecified – it's version 1.0. Some of important issues aren't clear formulated, others aren't even thought off;
- one the other hand – if you look at the spec, it is far too complex – nobody will use it, especially not authors of courseware, because they don't understand it;
- and, besides, it's not very sophisticated. It has only simple process modeling. It has no breath-taking new instructional design feature in it;
- and, anyhow, is it really what somebody needs who starts with e-learning?

So, what to do with this ambitious specification – use it? Or discard it?

In our research project we decided simply to use it – just to give it a try – what ever happens. That meant: Our goal was a conceptual examination and empirical evaluation. And we stayed critical and constructive in the experimental use of IMS Learning Design. It was experimental use – to find out about a few aspects of IMS Learning Design we considered as criteria for evaluation.

Building conceptual models for educational content

- [1.] Classifying elements
  - educational, instructional, pedagogical categories
- [2.] Aggregation of elements
  - hierarchical-sequential
  - any directed graph, e.g. topic map
- [3.] Design and run a teaching-learning-process
  - suggested way through aggregation of elements
  - Interaction between learner(s), staff, machine

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Let me state another remark, rather a theoretical basis – as a common ground to start from. When we look at the task of building conceptual models for educational content, I for myself differentiate three import steps – we can also see them as functions of the conceptual models.

- First we build elements for educational processes. In my opinion, we rather divide content for educational processes into bits and pieces – but anyway – we have these elements to be classified. Whatever they are – raw media objects, learning objects, knowledge objects, course objects, instruction objects, learning-objective-objects, assessment objects, we can consider them simply as nodes. We have to describe them in educational, instructional, pedagogical categories. That is the first step – building classes of elements for educational processes.
- Secondly we have to put these elements together – we do any sort of aggregation, to build things like lessons, courses and units in webbased training and so on. Usually we tend to use a hierarchical-sequential form of aggregation. We build learning units from media objects, course units form learning units, we use terms like section, chapter and so on. On the other hand we might aggregate elements in any form of a directed graph, for example as a topic map – with domain-based or educational relations.
- But thirdly – and this is the most imported point – we have to design and to run a specific teaching-learning-process. This process might be created by an author or an teacher, or it can be created automatically by a adaptive learning system. This process is a suggested way through the aggregation of elements – there can be more than one, if we want to provide different methods of learning. This way means interaction between learner and content, but also interaction between learners in class, learner-teacher-interaction and human-machine-interaction.
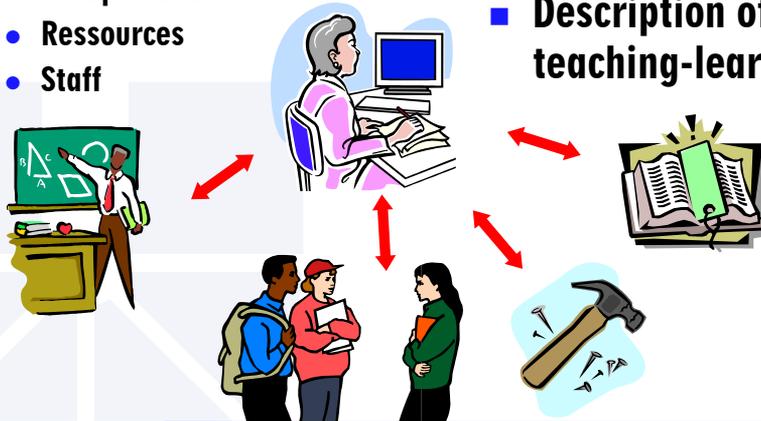
Often we stay with the second step and expect the aggregation of content itself is the teaching-learning-process.

When we expect the aggregation of content itself can be a learning-process, we imply a teaching-learning-process only suitable for one certain teaching-learning-situation: This is the single learner in self study with media. This situation was often characterized with the notion of "the loneliness of the long distance learner".

Now well, this situation, this picture of the single learner in front of a media device is often implicit to many conceptual models for educational content. But:

If we look at teaching-learning-processes we find in the wild, and when we look at teaching-learning-processes we really want to create – we have more relations than just the singe-learner-to-media-relation. It's the relation of the learner to the group of learners, to ressource for learner (media, yes, but also tools and real-world objects) and to staff.

A teaching-learning-process can only take place when there are meaningful learning activities performed by the learner, and this implies learning objectives. So this is where IMS Learning Design comes in – to provide a framework for the description of the teaching-learning-process in general.

IMS Learning Design
Objective of the specification

- **Completeness**
  - Integration of the **activities** of both learners and staff members.
  - **Integration** of resources and services used during learning.
  - Support for a **wide variety of approaches to learning**.
  - Support for both single and **multiple user models** of learning.
  - Support mixed mode (**blended learning**) as well as pure online learning.
- **rather process than content**

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Now, the keywords on the slide are taken from the objectives of the IMS Learning Design specification. "Completeness" is one of the goals for the specification.

- This objective starts from activities of both – learners and teachers;
- resources, this means media, are integrated during learning;
- any design – a wide variety – of pedagogical approaches should be supported;
- and, very important, it's about learning in groups of learners;
- and it's about learning in face-to-face-situations as well.

Shortly: IMS Learning Design captures rather process than content.

IMS Learning Design
Organization of Learning Activities

■ **Core Concept**

Persons
in **roles** of either learner or staff
perform **structured learning activities**
(resp. support activities)
within an **environment** of **learning objects** and **services**
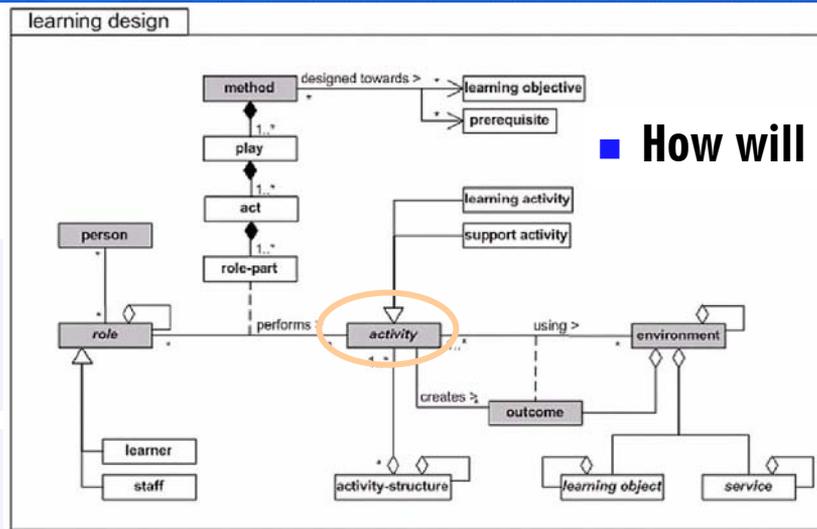in order to meet **learning objectives**

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We defined – as intepretation of the specification – this to be the core concept of IMS Learning Design:
- persons in roles;
- structured learning activities;
- learning objects and services in an environment;
- learning objectives.

To be exactly: IMS Learning Design comes in three flavors – Level A, B, C. Level A is the most simply based on this core concept. When we talk of "core concept", we refer to IMS Learning Design Level A.
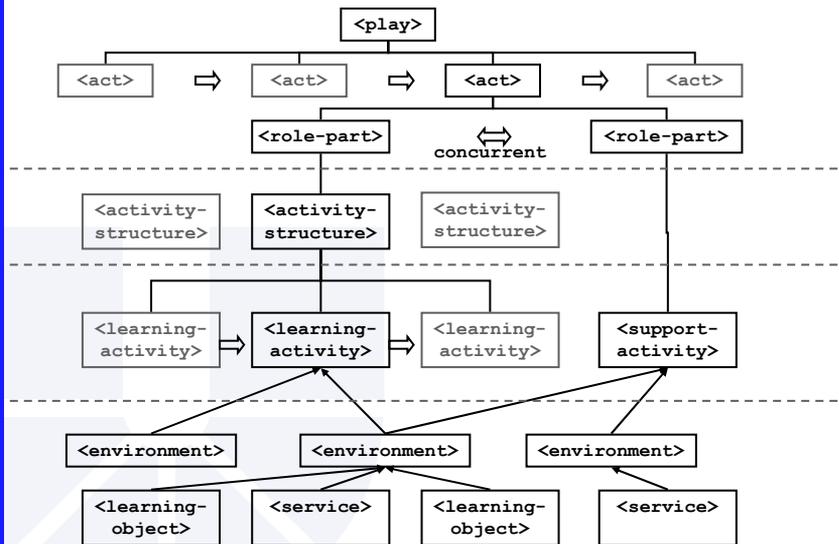
Figure 3.1 - Conceptual model of Level A.

On the slide you see the information model of IMS Learning Design Level A. You find the element "activity" at the core of this model.

In our research project we asked: How will this work? How can activities of learners and staff be prompted by the technical learning system? What are learning activities meant to be?

Taxonomy of Sequencing („Artikulation")

```
                        <play>
          ┌──────────────┼──────────────┬──────────────┐
       <act>   ⇨      <act>   ⇨      <act>   ⇨      <act>
                   ┌─────┴─────┐           │
              <role-part>   ⇔   <role-part>
                          concurrent
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   <activity-      <activity-      <activity-
   structure>      structure>      structure>
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   <learning-   ⇨  <learning-   ⇨  <learning-    <support-
   activity>       activity>       activity>     activity>
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   <environment>   <environment>   <environment>

   <learning-      <service>    <learning-    <service>
   object>                      object>
```

Well, the elements we just saw are put together to build special levels of aggregation.

Because these levels of aggregation refer to the teaching-learning-process, we called this a "Taxonomie der Artikulation" – with "Artikulation" as a technical term in German educational theory.

The term "Artikulation" could be translated into English roughly with the term "sequencing".

You can read this top down or bottom up.
   • Top down would be the view of a learner. A learner realizes a sequence of phases within a unit-of-learning. They're called "Act", and in the process they're clearly separated sections. Within a section, there are activities assigned to a role. While a learner does this or that, the teacher does another activity. While learners do an exercise, teachers provide help. Performing an activity can be structured by container elements activity structure. Therefore on the lower level – a learner realizes a sequence of activities (there might be also a choice of activities). In order to perform these activities, the learner finds resource in the learning environment.
   • Bottom up would mean the view of a course designer for a unit-of-learning with IMS Learning Design. A course designer would put resource for learning together into learning environments. Then, he would consider what learners have to do with the resources for learning. He will think of learning tasks, of activities and a structure to them, which will build up to a method like problem-based-learning, project method, group discussion with presentation, case-studies and so one. These methods within a play can be sequenced with the elements learning activity, activity structure, role-part and act to describe these methods. A course designer will put together roles and activities to a method, which will have separated sections.

Probably an Author wants to reuse a method. So he can take a structure top down and put new learning material into the learning environment.   9

Characteristic concepts

- **`<learning-activity>`**
  - **Smallest complete unit in process**
- **`<play>`**
  - **unit-of-learning**
  - **a certain method**
- **`<act>`**
  - **Synchronization of class**
- **`<role-part>`**
  - **Concurrent processes**

- **`<environment>`**
  - **Container for resources**
  - **reusable, linking element between activities an resources**
- **`<service>`**
  - **to be instantiated at runtime**
  - **selective use**
- **`<learning-object>`**
  - **unspecified …**

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We consider the taxonomie of sequencing quite characteristic for IMS Learning Design. Therefore, here some specific features of these concepts.

- The learning activity is the smallest complete unit in the process. For the learner, a learning activity is considered as a situation – step by step.
- The play stands for the whole unit-of-learning. A play represents a certain method. When there are more than one plays, they are alternative methods for the same content.
- The element act is important for synchronization of class. Whenever we go from one act to another, all learners are affected. There are concurrent processes within an act, but none from act to act.
- The concurrent processes are represented by the element role-part – while one role does this, the other does that – and there are no concurrent processes elsewhere.
- Environments are the linking elements between activities and resources. Resources *can't* be assigned to activities directly. Hence, environments are container elements. They are packages, in which a course designer puts anything a learner needs at a certain step in learning.
- Services are mainly communication services. They have to be instantiated at runtime. Learners and staff are assigned to them as users. IMS Learning Design enables rather selective use of the services – it's not just like a technical newsgroup or a social newsgroup for a online course as a additional service. Newsgroups and Internet-Relay-Chat (to name one a few services) are integrated exactly at the point where they are needed.
- And well – learning objects. These are any resources used in the learning process. In IMS Learning Design they are more or less unspecified.

Research Project

- **Objectives**
  - conceptual examination *and*
  - empirical evaluation (from a educationalist's perspective)
  - in experimental use (courses at university)
- **prototypical Runtime-Environment**
  - "lab005" – *Lern- und Arbeitsbereich*
  - IMS Learning Design as course structure
  - based on Open-Source-LMS „Moodle"
 - formative evaluation
  - User Requirements Engineering
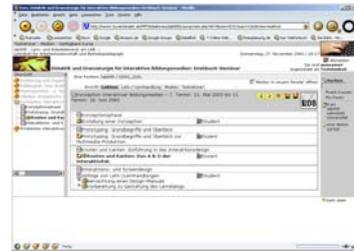
In research project we've used IMS Learning Design experimentally in courses at university for two semesters. An empirical evaluation was supplemented by a conceptual examination – both from an educationalist's point of view.

For the evaluation of IMS Learning Design it was necessary to build a prototypical runtime environment, called "lab005". In this prototypical runtime environment IMS Learning Design describes and represents the course structure. This runtime environment is based on a learning management system called "Moodle".

The prototypical runtime environment "lab005" was formative evaluated – for the formative evaluation we chose a user centered approach, with a mix of quantitative and qualitative tests.

As a runtime environment "lab005" was not developed to provide 100% functionality of IMS Learning Design – it was build towards the purposes of evaluation. So "lab005" has a fairly limited scope.
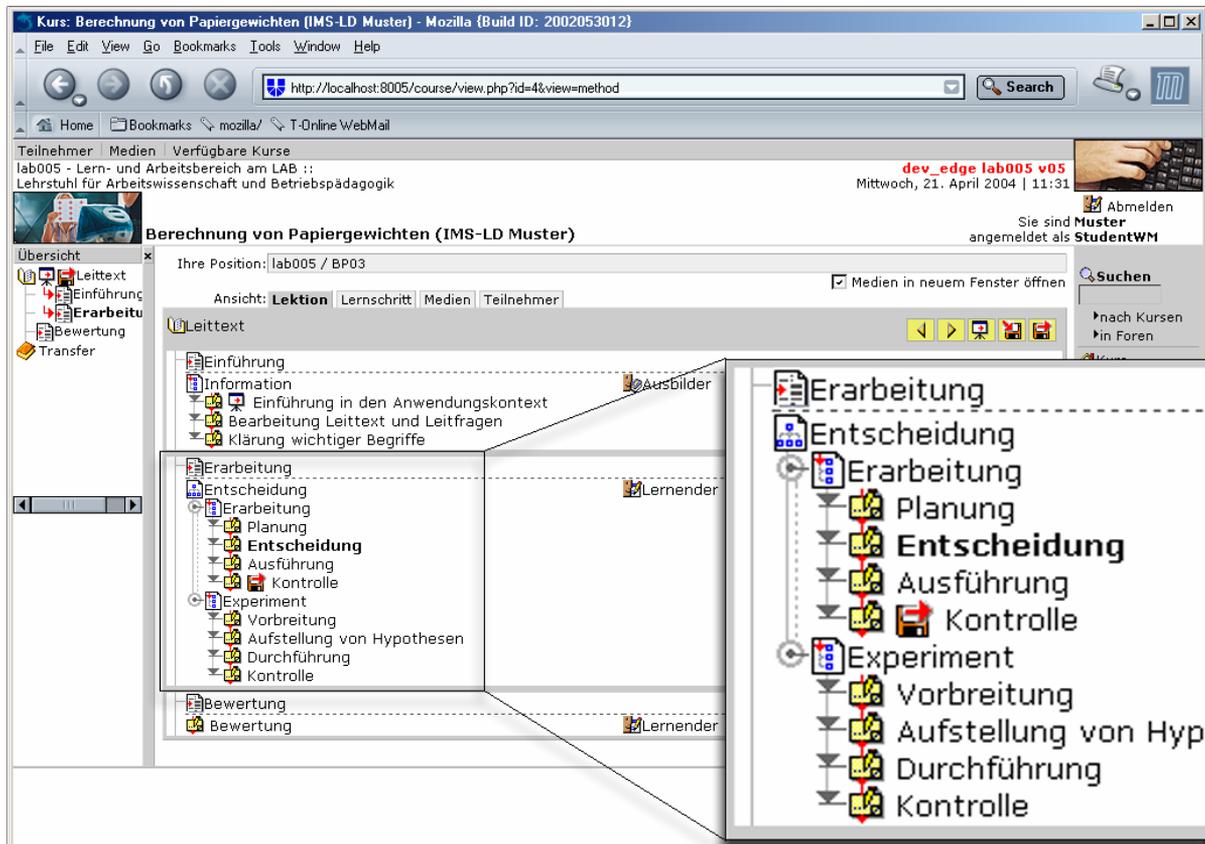
Here are a few views of the prototypical runtime environment.

The hierarchical-sequential tree represents the method – this is the taxonomy of play, act, role-part, activity-structures and learning activities.
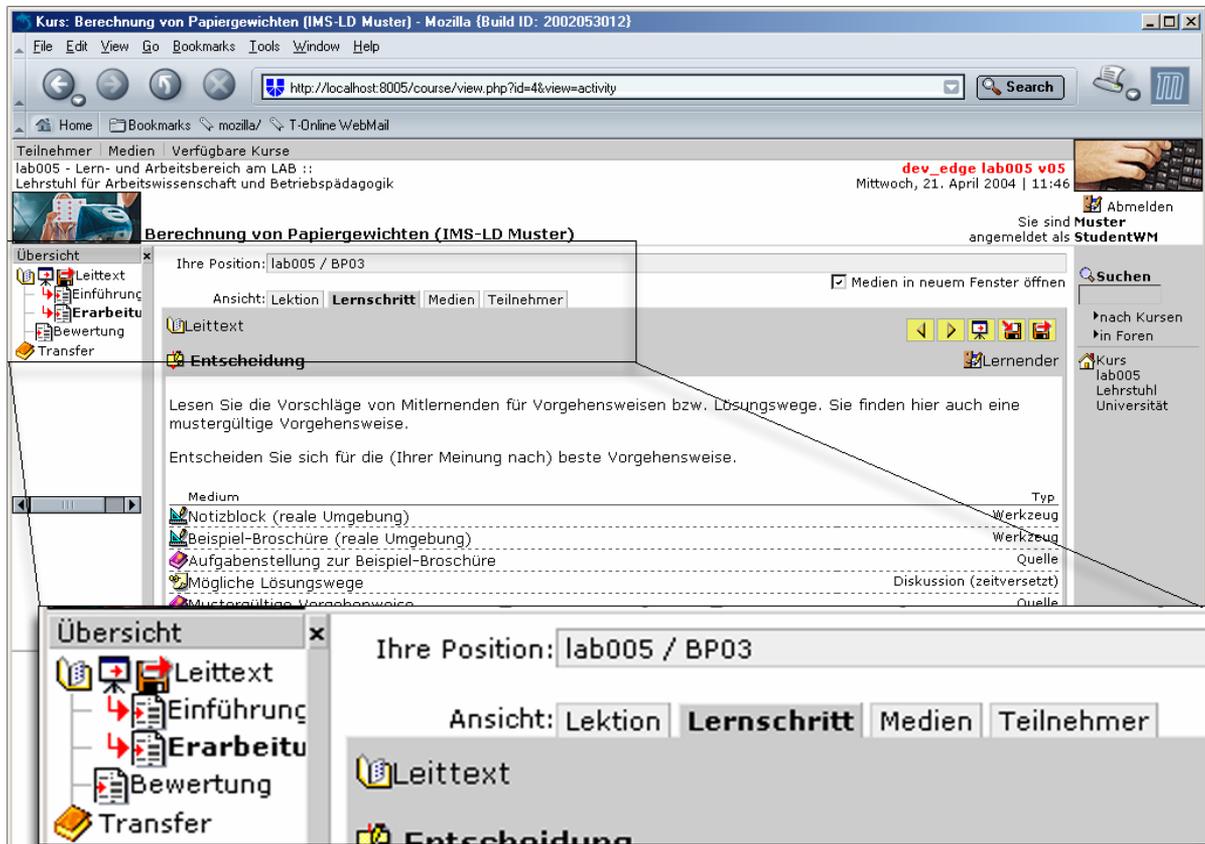
Views can be switched by tabs represent the levels in taxonomy of sequencing. So the learner has a view on the whole course, the method, and the singe learning activity.

The view of the single learning activity is represented on a sort of cue card – all resources in the environment are listed as learning objects and services. They open in new windows – so they are parallel at hand to perform the learning activity.
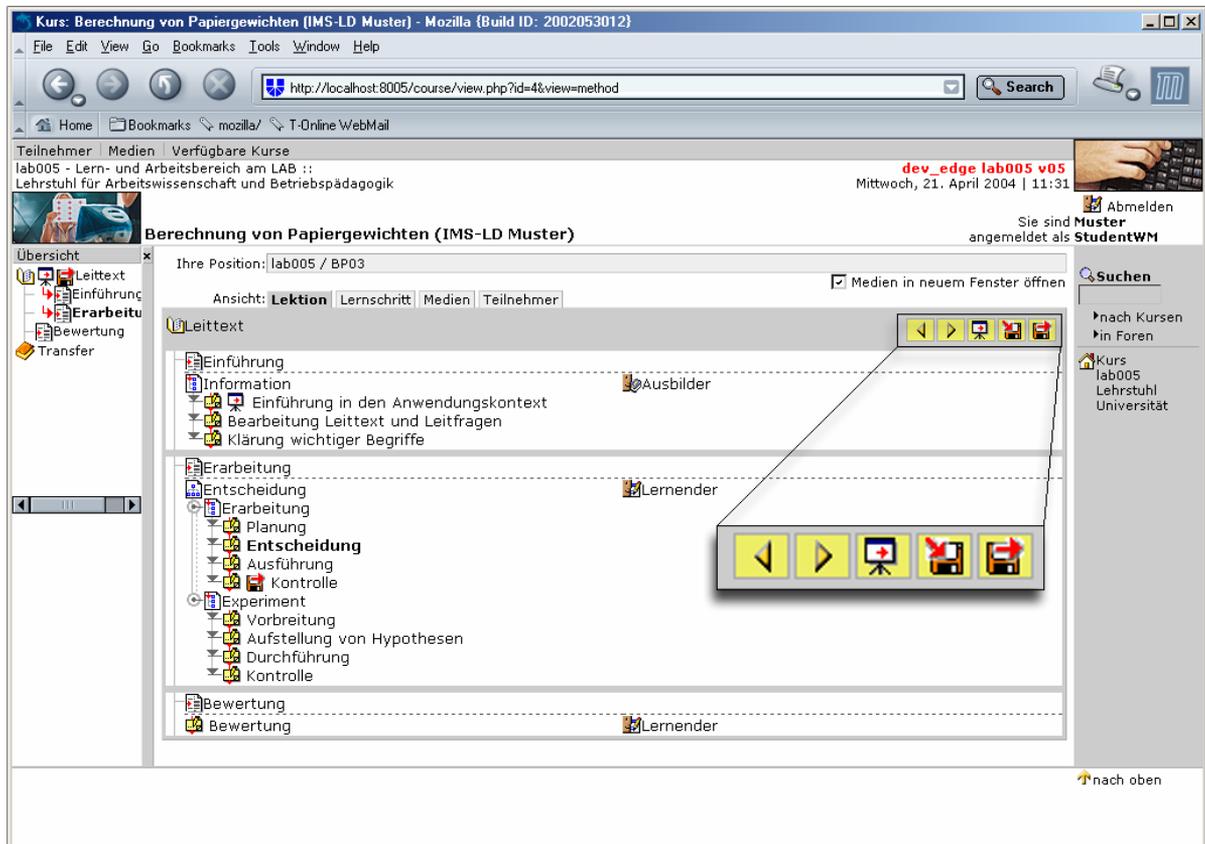
Thirdly – we introduced status marks and we learned, that there have to be at least three status marks:
- one for the current view while browsing,
- one for a bookmark of the current learning activity,
- one for the course – this means for the class.

Results

- **Organization of learning activities**
  - Taxonony of sequencing proved useful
  - but: user control is most important requirement

- **Environment**
  - Useful concept for authoring, not for learner
  - Learning Activity as the smallest complete unit

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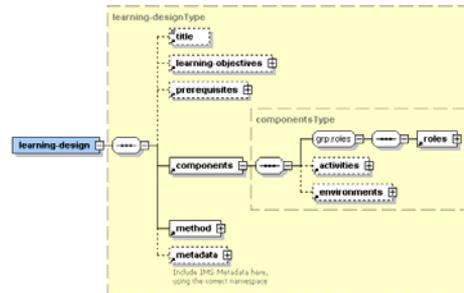What we learned – here are some results of examination and evaluation:

- To begin with – building courses as an organization of learning activity is the core concept in IMS Learning Design. We kept the statement, that it is possible to design and run units-of-learning as a special organization of learning activities. We found the taxonomy of sequencing to be useful, too. But for the user interface it is most important that the learner has control in browsing within the unit-of-learning. Only since he can explorative access all elements at his wish, he is accepting the guidance by the system.
- Secondly – we found the environments as container elements are a useful concept for authoring, but not within the user interface for the learner. With environments a course designer might perfectly structure the resources within a unit-of-learning. But the learner has the learning activity as the smallest unit – and wants access to all resources he needs for this activity (I state this as important a result, because this interpretation is opposite to the understanding of the element environment in the specification).

- Thirdly, we found difficulties in face-to-face-situations. There's a challenge in reference from the user interface to real life objects used for learning or to face-to-face-situations for communication in class. Furthermore, IMS Learning Design lacks in description of teaching-learning-situations, which are synchronous between teacher and learner – like giving a lecture with questions and discussion or giving a task to groups with help from the teacher. These complementary teaching-learning activities can only be described very complicated.
- Forth, we learned that a classification of resources is not important for the learner. A learner is not interested in types of learning objects. What kind a learning object is, is described by the learning activity. Hence, learning activities make objects to learning objects.

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Thank you for your attention. Please let me know if there are any questions I might be able to answer for you.

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