

## **The Application of Didactic Models in the Context of E-learning-based Study Preparation The Project UnlbELT**

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### **Abstract**

Many research projects in Germany often focus on the technical implementation and the pedagogical use of web-based learning and teaching forms in the context of education at universities and colleges.

The future students obtain their university entrance in Germany in academic high schools, vocational schools and technical secondary schools. Here the use of e-learning in the classroom is primarily in the testing status, because didactic scenarios for creating a meaningful, learning-goal-oriented use of this method in the classroom are not developed yet.

In the project UnlbELT web-based teaching and learning scenarios for study preparation using didactic models were developed. Tests with more than 1300 students aged between 16 and 18 from the German state Saxony have shown that none of the existing didactic models is suitable as a standalone-model for the implementation of e-learning in schools. However, each of the considered models is able to make a contribution for designing, structuring and implementing e-learning scenarios.

The implementation of more than 80 e-learning courses in 21 academic high schools in Saxony revealed knowledge and experience regarding the application of didactic models especially for the implementation of e-learning scenarios at schools, which are presented in the article.

### **Keywords**

E-learning, web based learning, didactical model, academic high schools

## **BACKGROUND AND DIDACTICAL MODELS**

### **E-learning at schools and universities**

Social networks have become omnipresent and social media is especially for the youth the most widely used form of communication on the internet. Four-fifths of young people in Germany regularly use platforms for communication, 57% log in daily in communities, two thirds of them several times. (Moran & Seamann, 2012) However, these communication platforms are primarily in use in the leisure sector and for the maintaining of social contacts outside the school environment. For web-based collaborative learning or working on a common learning task the communication channels are rarely used.

The use of learning platforms at school is largely restricted to file-sharing and communication between teacher and students. Less than 30% of interviewed teach-

ers use learning platforms for independent work outside the classroom. (Karbautzki & Breiter, 2011)

Worldwide more than 80% of students under 35 years use social media offers, 64.4% monthly in private use. 44.7% of the universities and colleges use social media professionally, but only 33.8% for teaching. (Medienpädagogischer Forschungsverbund Südwest, 2012)

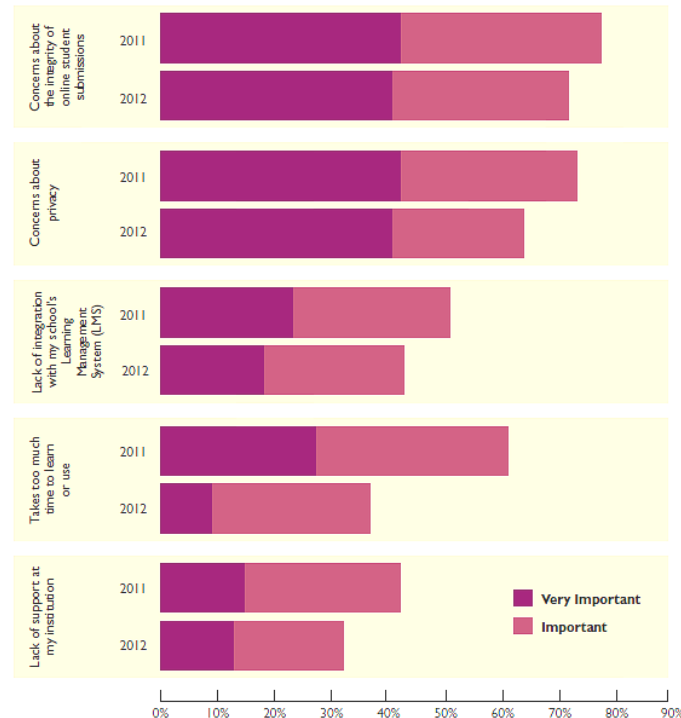


**Figure 1:** Barriers to Faculty Use of Social Media (2011 and 2012) (Moran & Seaman, 2012)

The causes for the discrepancy between the high utilisation of communication platforms in the private sector and the low degree in professional teaching in schools and universities may be due to the barriers the teachers see in the use of social media for teaching.

Here are mentioned inter alia concerns about the use of online services for learners, problems in dealing with learning platforms, the increased time required and the lack of adequate support structures.

It is clear that these barriers are further reduced and the establishment of web-based teaching and learning shows an increasing trend.

The possible scenarios for the implementation of e-learning in schools are not limited to the typical teaching-learning situations in the classroom. The academic high schools in Saxony have developed their own concepts for study orientation and study preparation, in which e-learning scenarios can be integrated.

In this context knowledge is transferred not as a part of a specialized curriculum but as an overview of some selected fields of study and the expected level of requirements. The application of e-learning for study preparation at schools represents a new field which was investigated in the project UnIbELT.

### Aspects of a web based study preparation

The ESF-funded project UnIbELT had the focus on preparing students aged between 16 and 18 for their changeover from the methodologically varied but relatively heavily controlled learning area at school into the increasingly web based and self-directed learning environment at colleges and universities. (*UnIbELT stands for*

*Changeover from school to college with the support of Internet-based E-Learning tools)*

It has been examined how e-learning scenarios are useful as a complementary offer for a long-term study preparation. The project specifications have restricted the target group to pupils of secondary education in grammar schools of the German State Saxony.

The focus of project activities for the establishment of e-learning scenarios in the schools was on the following three areas of action:

1. *Web-based study orientation:* Before entering into higher education, the students received access to the learning platform OPAL, where all Saxon colleges and universities are represented. (Richter & Morgner, 2009) This gave them the opportunity to get access to all other freely accessible learning contents of universities in addition to the courses of the project and to get an overview of the courses offered within the study directions.
2. *Study preparation:* The students got an insight into the demands which are to be expected in selected fields of studies at the beginning. Starting point were interviews with higher education teachers, materials and video recordings of lectures of the first year.
3. *Development of self-directed learning skills:* During the term of an e-learning course the pupils reflected their own skills regarding the self-organization of learning, the time management as well as the independent problem solving and developed them further. They were thereby encouraged to use different communication channels such as forums or chat rooms on the problem solving process.

### **Didactical models**

Concerning the applicability of didactical models in e-learning scenarios the considerations focused on two project phases – the development of web based e-learning courses and their didactic-methodical implementation at schools.

First the selected didactic models are considered in their essential contents. These are:

- Model of the education-theoretical didactics (Weniger, Klafki, Kramp),
- model of the teaching-theoretical didactics (Heimann, Schulz)
- model of curriculum didactics (Mager, Möller, Meyer)
- model of action-oriented didactics (Piaget, Aebli)

The question arises here: Which of these didactical models will be suitable for the preparation of e-learning scenarios?

### **Model of education-theoretical didactics**

This model includes five basic questions for defining educational content:

- What is the importance of learning content already in the intellectual life of the learners?
- What is the importance of learning content for the future of the learners?
- How is the content structured from an educational perspective?
- Which general problem does the content open up? What are the general facts which are to be derived?
- What kind of phenomena, special cases and situations are suitable to motivate students of specific age and grade structure? (Jank & Meyer, 1994)

A critical aspect of this model is the lack of statements about methodical planning and about medial use.

### **Model of teaching-theoretical didactics**

Here are four time-levels of planning contained:

- Perspective planning: Lessons for an extended period (semester, year, etc.) will be structured.
- Second outline planning: Individual lessons are being prepared as part of the amounts recognized in the perspective planning.
- Process planning: Inside the outline, individual lesson steps and communication and working arrangements are set.
- Planning correction: Unforeseen impacts on the planning process implemented to be considered later.

The critical moment is that there is no help for the concrete implementation methodology.

### **Model of curriculum didactics**

This model is directed towards learning objectives, at first the definition of learning goals, then the choice of content, methods and media.

But the critical aspect consists in the contemplation of learners as “objects” who respond to certain stimuli (stimulus, input) with black box behaviour (response, output).

Learning objectives are divided into a hierarchy: Indicative goal → gross goal → fine goal

The fine targets have to be deduced from indicative and gross goals by operationalization. Learning objectives are dimensioned in cognitive, affective, psychomotor learning goals. Using taxonomies gives the opportunity for describing possible didactic scenarios into criteria and categories, to classify them and to make them comprehensible by operationalization. (Redaktionsteam PELe, 2006)

The critical aspect is: Used definitions are not unambiguous, activities like “remember” or “understand” cannot be operationalized.

### **Model of action-oriented didactics**

An essential feature of this model is the intensive inclusion of the learners into the planning process and executing an e-learning scenario.

Planning lessons is considered as an open process with the following basic assumptions: holism, task orientation, self-activity, outcome orientation, interest orientation and participation. (Jank & Meyer, 1994)

## **USAGE OF DIDACTICAL MODELS IN THE PROJECT UNIBELT**

### **Development of courses from a didactical perspective**

In the project UnIbELT a learning time of 10 to 15 hours per course was assumed. One hour of real time learning requires a time of 20 hours for the creation of the learning sequence (Clauß, Döring, Gerth, 2010), so a time effort of over 200 hours was to be expected.

The results of other e-learning projects aimed at schools (like ELeaS and eLBe) showed that in the context of the workload of teachers in the schools the creation of e-learning scenarios cannot be realized in a reasonable time as an additional service.

Therefore for the performance of the project UnIbELT the group of student teachers was favoured. They have experience in the use of the learning management system OPAL, which is in the Saxon colleges and universities now widely established (Richter & Morgner, 2009). It can be assumed that this clientele has the necessary knowledge about didactic models and may use it within the development of courses.

The development of courses began with the search of the topic and the justification of the relevance of this topic for the study preparation under the aspect to the existing knowledge base of the pupils as a target group. Here, a catalogue of questions based on the contents of the model of education-theoretical didactics served as a guide.

After confirmation of the relevance of the course topic, the authors formulated the coarse and fine targets for the implementation on the basis of the model of curricular teaching. After consultation with experts in the field and teachers of secondary schools the need was confirmed to develop this e-learning course. Afterwards could the course author be commissioned with the further development work.

The next step was the segmentation and subsequent sequencing of the planned learning material in use of the model of education-theoretical didactics. The result of this was a structure in which the later learning sequences had been included, underpinned by the first sample tasks.

First the course-development was based on school subjects, because most of the project staffs are teachers of mathematics, physics and computer-science. So the first courses had content topics such as "mechanics", "systems of equations", "logic circuits" and so on. Later this curriculum was abandoned and courses about "learning technology", "psychology" or "university English" were developed. Currently 25 courses are available on a wide range of topics.

The first chapters of learning content should be oriented on the knowledge base and the learning-level of students in academic high schools. But during the course the requirement of learning increases and ends at a level, which is comparable to the learning level of the first semester. So the students are able to test whether they would reach this starting level at university.

During the subsequent course development, the authors were briefed by the relevant project staff on a regular basis. Here the attention was directed on the implementation of didactic principles like practical experience or scientific orientation etc. using basic assumptions of the model of action-oriented teaching. Special attention was given to the development of communication skills; finally, the pupils should communicate during the self-learning process with their classmates and the course tutor via web and had to work collaboratively to solve problems.

At the beginning of the project it was analysed, which didactical and technical means are available to create courses. Based on this study the "Guidelines for the creation of e-learning courses in OPAL" were created as the initial version. The aim of the guidelines is to support the authors in the planning and the authoring of courses.

In addition, it was possible to ensure that all courses follow a basic plan of content and a unified navigation structure. The guideline-document includes information about course content, review of task solution, the course structure, the groups and rights management, as well as the learning way control. So a framework for the course creation has been set - but not as rigid requirement. The use of templates would be a rigid frame and a drastic intervention in the didactic freedom of course developers. (Döring & Dietsch, 2010)

The experiences of the authors from the course-development resulted in a written "Workflow for authors of e-learning-courses" which aimed to make the creation of e-learning sequences as practical as possible for the authors from technical and didactical points of view.

The evolved method builds on the experience of the course developers in the use of office systems and allows formulating future learning content at first in OpenOffice. Using the model of the teaching-theoretical didactics, the content has been evaluated and possibly revised. Only then the transfer from the text document into the xml format using the extension Writer2XHTML was executed. This allows, in conjunction with MathML the export of mathematical formulas and symbols, so the browser is able to display the content in the original form. This continually evolving workflow was given to the course authors as a collection of pre-configured, available tools. (Dietsch & Spalteholz, 2011).

The use of this workflow gave the opportunity to focus the attention of the course-authors more on didactical aspects than on technical questions. The created work-

flow is offered to use by authors in other e-learning-projects and is available as print-version too.

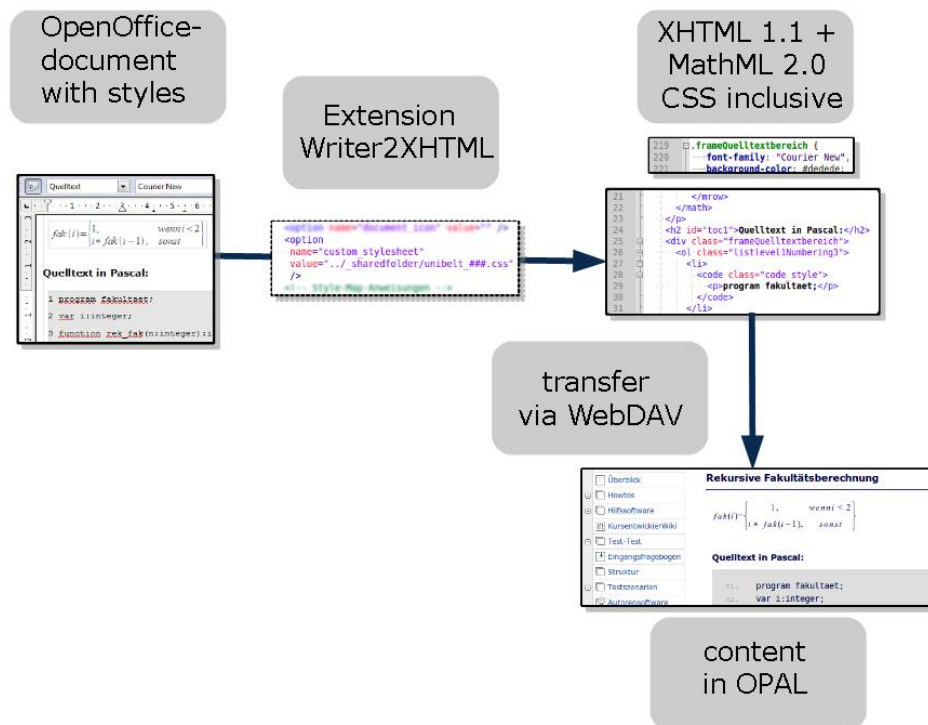


**Figure 2:** Workflow from office-document to xml, example: export of a program code (Hofmann & Spalteholz, 2012)

Before the courses were tested at schools a three-stage evaluation took place. On the academic-content level university staff from the respective department has checked courses for correctness and representativeness. Persons outside e-learning experts subjected the courses to an examination for compliance with e-learning specific requirements for content display, for the length and the graphic design. On the didactic level teachers evaluated the courses in terms of student-oriented levels, the adequate pass of the starting level and the methodology. E-learning experts but non-specialists on the thematic field have made an examination for compliance with e-learning specific requirements for content display, the length and the graphic design of content. On the didactic level teachers have evaluated the courses in terms of pupil-oriented starting level and the methodology. Upon completion of this three-stage evaluation and possible revision of the course the first test in the schools has started.

### Course implementation at schools

The project rules determine academic high schools in the German State Saxony as a target group for implementing the created e-learning scenarios. The course start at the school took place in the presence of the Project Coordinator. This allowed the establishment of personal contacts with the supervising teachers and with the participating students and improved later the communication between the project management and the partners involved in the schools. The execution of the course start by the coordinator of the TU Dresden has allowed some first insights into the social structure of the student group and the teacher-pupil relationship. Both aspects influenced the further collaboration of students and the communication between them and the teacher.

Over time it was increasingly common that students had already completed one or more courses in the project UnlBELT. If a course-start was planned with a share of more than 75% of students with experience in the handling of UnlBELT courses,

then a start variant via online conference was tested. Course Starts presented via web conference between the project coordinator at the TU Dresden and the academic high schools provided students and course tutors with a new experience in terms of web-based communication.

The execution of one e-learning course was planned over an average duration of 8 weeks. In this time the students work primarily at home or in study groups at school outside of regular teaching time. The teacher supervised the students in case of substantive problems and corrected the online submitted solutions. For technical questions of students or course tutors project staffs of the TU Dresden were available via Skype or mail.

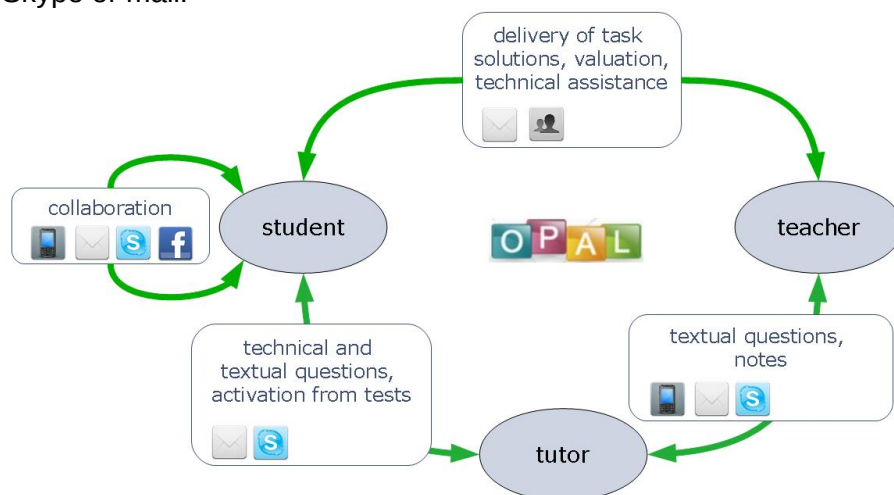


**Figure 3:** Scenario of course run and communication channels (Hofmann & Spalteholz, 2012)

The pedagogical challenge for the course tutor was on the one hand the execution of the course not lead too heavily to develop the competency of independent learning of students. At the other side the experiences from interviews with students showed, that differentiated supervision by the teacher is necessary in terms of the motivation to a consistent execution of the whole e-learning course. The care of students from multiple, geographically distant schools by one teacher was realized only in exceptional cases. In terms of the sustainability of the course methodology this should be practiced more intensively in a follow-up project.

The course ended with a joint final interview, conducted by the project staff on-site with the students and the course tutor using a question guideline. In preparation of this event the results of the course were analysed from the perspective of the project staff. The students were questioned about their experience in terms of competencies in independent learning, their own time management and the dealing with the learning platform OPAL.

## INFERENCE

### The suitability of didactical models in the project

The model of education-theoretical didactics was used at the beginning of the course-development to analyse the advised learning content in terms of its suitability for e-learning. The lack of statements about methodical planning prevents the application of this model in further phases of the development of e-learning courses.

Using the model of curriculum didactics it was possible to support the defining of the gross goal and the fine learning goals. Tests and tasks were formulated by the authors based on operationalizing.

The model of teaching-theoretical didactics served as a helpful guideline for structuring of the learning content, and the model of action-oriented didactics is based upon the implementation of learner- centred teaching methods to activate the learners. .

Result: None of these models is suitable as sole solution for the development and the realising of e-learning-courses at schools but all of them can make a contribution.

### Insights about aspects of web-based studies orientation

Within the frame of the project UnIbELT 24 course modules were created, which were tested in more than 80 running courses at the schools. About 1300 students have participated in e-learning courses under supervision of course instructors.

So UnIbELT is one of the first projects that had tested e-learning in these dimensions in practice at high schools in collaboration with teachers. It succeeded to initialize the application of e-learning in the field of study preparation and study orientation and to transfer those into a new dimension.

The development of a comparatively large number of courses in a project has demonstrated that it is necessary to develop, to document and to test the design for special e-learning methods to meet the specific requirements of the course development for school's needs.

This was achieved by technical assistance, by methodological and structural leadership, as it is guaranteed by the guidelines for course developers, as well as by an evaluation including the different perspectives of the target group, course authors and university staff.

The implementation of a large number of similar courses in the same age group showed, that also a tutorially care for the students of academic high school is compulsory. In this time the students will need support by a tutor not only for monitoring and evaluation of test solutions as well as for answering technical questions, but also for developing their self-learning competencies and motivation for consistently processing of each e-learning-course.

The successful courses also have led to the realization, that the schools are not able to administrate the courses alone. Consequently, a time-resistant infrastructure has to be created to allow both - the organization of the courses as well as the emergence of new learning sequences.

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## Biography



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