

# physik multimedial

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## Abstract

The German project physik multimedial [2] offers a free accessible platform for medicine and other students who study physics as minor subject. It is founded by the Ministry of Educations & Research (bmbf) [1].

A complete course management both for teachers and students including learning material and scheduling is presented on the technical side. Communication tools are given as well.

The VLE has of five different topics:

- self-study units about e.g. oscillations and waves,
- multi-media data base / archive
- online material on physics (via LiLi)
- exercise management and
- didactics.

LiLi - the Link-List database to e-learning material in physics consists of well documented links with meta data and a search engine of distributed sources.

The project is a conglomerate of eight groups at five universities in the northern part of Germany. Experts in didactics, experimental physics, informatics and information management work together to create this environment and some exemplary content which can be accessed at <http://www.physik-multimedial.de> .

## 1 Introduction

The enhancement of physics lectures, especially for biology and medicine students is the goal of the project physik multimedial. Lectures are not to be replaced but to be enriched by new didactical concepts and multimedial modules.

Different kinds of modules have been created: self-study units, an exercise server, a multi-media data base, didactical instructions and LiLi - a search engine for physics' elearning material are offered on a virtual learning environment (VLE). The modules and especially LiLi are presented here.

The group in Oldenburg is advised by Prof. Dr. E. R. Hilf, CEO of the Institute for Science Networking [3]. Focus of this group is the setup and the operation of the project's server and the platform as well as the database called LiLi.

Additionally the group develops a self-study unit on trigonometry and takes care of the meta data for the project. Two workshops concerning the special needs of female students took place in Oldenburg already.

The leading project manager is Prof. Dr. Schecker, Bremen. The project started in April 2001 and will end in December 2003.

## 2 The virtual learning environment physik multimedial

The virtual learning environment physik multimedial is a further development of „Campus Virtuell“ [4], a platform which has been developed and used during the last semesters by economy students in Oldenburg.

The platform is open to students and lecturers, they only need access to the internet and an email address. Lecturers may apply for special rights. At the moment, costs occur at no point.

The functionality of the platform may be classified into two fields:  
A course management and physics' modules.

### 2.1 The course management

Courses with lectures, exercises or seminars may be supported by the platform. Basic data like information on time and location of lectures as well as news on the course can be saved and viewed. Course material and hyperlinks can be uploaded, managed and structured in weekly plans.

Ein Angebot des Projektes "physik multimedial - Lehr- und Lernmodule für das Studium der Physik als Nebenfach" im bmb+f-Programm "Neue Medien in der Bildung". Online seit September 2002.

Verband Norddeutscher Universitäten Projektträger Neue Medien in der Bildung PhG bmb+f

You are logged on as guest Server carrier: Institute for Science Networking, Oldenburg - [Imprint](#)

**Note:** These pages are optimized for Internet Explorer 5.5 (or newer), Netscape 6 (or newer) and Mozilla 0.98 (or newer). JavaScript must be enabled. The use of Netscape 4.x can lead to display errors.

Figure 1. Starting page of physik multimedial

Different communication tools are accessible: a forum for every course to structure comments and questions, the possibility for lecturers to email to everyone and a chat server as a sychrone completion.

These tools may be used to discuss lectures and help to improve the contact between students and lecturers. There is also a possibility to send notes dictectly via the platform. Combined with the status of the person (online / offline) a very quick communication is possibliliy.

## 2.2 The modules

The virtual learning environment physik multimedial also provides access to the physics' modules.

### Self-study units

Students have the possibility to acquire knowledge by using the self-study units. Multimedial elements like animations, pictures or films illustrate physics' topics. Lecturers may shorten the offered units by adding a relevance to each page of the self-study unit. At the moment, the self-study units "oscillations", "waves" (group of Prof. Dr. Ryder) and "theory of errors" (group of Mr. Wilke, Greifswald) are online. Some more topics are under construction.


### The multi-media database / archive

Pictures and animations can be chosen and downloaded directly from the multi-media database. A catalogue and a search interface may be used for this. These lecture components can be integrated into lecture concepts to enrich them with multimedial elements. Due to copyright issues only lecturers may enter the multi-media archive, which was created by Mr. Rackwitz and Mr. Romanovskis (Hamburg). The training facility server

Exercises like multiple – choice questions or simple arithmetic problems can be created with the means of the training facility server. Lecturers have the possibility to pick examples from the catalogue.

Every student gets his/her own set of values, while the exercise stays the same. They may solve the problems online and get a direct response, if the answer is correct or not - at least if the lecturer wants him or her to know. The number of trials can also be adjusted. A course statistic is automatically available for the teachers, so they are always informed about their students' activity.

The group of Prof. Schick (Rostock) is responsible for the exercise module.



The screenshot displays the 'physik multimedial' web interface. At the top, there is a blue header with the 'pm²' logo and navigation icons. Below the header, a sidebar on the left contains a menu with items like 'Start page', 'Courses', 'Media', 'Modules', 'Exercises', 'Didactics', 'Mediabase', and 'Logout'. The main content area shows the course details for 'Wissenschaftliches Recherchieren und Publizieren im Internet'. The course is open for all semesters and subjects. The lecturer is Julika Mimkes, and the course is in cooperation with Eberhard R. Hilf, Thomas Severiens, Heinrich Stamerjohannis, and Michael Hohlfeld. The time/room is Thursday, 10:15 - 11:45 (weekly) in room W2 - 2 - 249, from 2003-10-16 to 2004-02-05. A 'News' section contains a paragraph about using online information services in science. At the bottom, there is a 'Change of course' dropdown menu.

Figure 2. Example of a course on the platform

## Didactics

Concepts how to teach and learn with the modules of physik multimedial are offered by Dr. Petri und Prof. Dr. Schecker (Bremen).

This includes scenarios how to use the platform, information on physics software, descriptions of other universities using physics multimedia elements, pedagogical and psychological principles, evaluations, information about Gender Mainstreaming and more.

## 3 LiLi: Links to physics' e-learning material

LiLi consists out of two tools: a data base and a search engine.

### 3.1. LiLi – the data base

At the moment LiLi contains around 600 links on physics' material, comments, ratings and detailed descriptions.

The descriptions are based upon the meta data of the project, which are composed of the meta data set of Dublin Core [5], IMS [6], LOM [7] and Ariadne [8] and some own meta data [9].

Comments and ratings are inserted by three different groups of users: experts, normal users and persons who register a link in LiLi. If three or more ratings are made, a mean value is shown.

LiLi' s main problem is the slowly encreasing number of links and comments.

Users are frustrated quickly when they do not find a result matching their search query. Despite the fact that every user of the platform of physik multimedial is allowed to insert entries, the number of contributions is growing slowly.

To guarantee the quality of the entries, the team of physik multimedial controls every entry before it is been activated.

The screenshot shows the starting page of the LiLi database. The header is blue with the 'pm²' logo on the left and 'physik multimedial' on the right. Below the header is a navigation bar with icons for home, search, and help. A vertical menu on the left lists various site functions. The main content area is titled 'Links zu Lerninhalten der Physik' and contains several paragraphs of text explaining the database's purpose and search capabilities. At the bottom, there is a search form with a text input for 'Stichwort', a dropdown menu for 'Physikalischer Schwerpunkt', and a 'suchen' button. The page also indicates that there are 218 entries in the database. A footer at the very bottom provides contact information and a date.

Figure 3: LiLi's starting page.

A catalogue like Lili needs a lot of maintenance. An automatic link checker has been implemented, but a manually check still has to be done to find out, if the linked content is still the one described.

To retrieve content that is linked from portals, Lili has been completed by a Harvest search engine.

### 3.2 Lili – the Meta data scheme

As mentioned above Lili offers detailed meta data descriptions of the resources stored in the data base. Altogether 43 fields are offered. Figure 3 shows an example of classified material useful for medicine and biology.

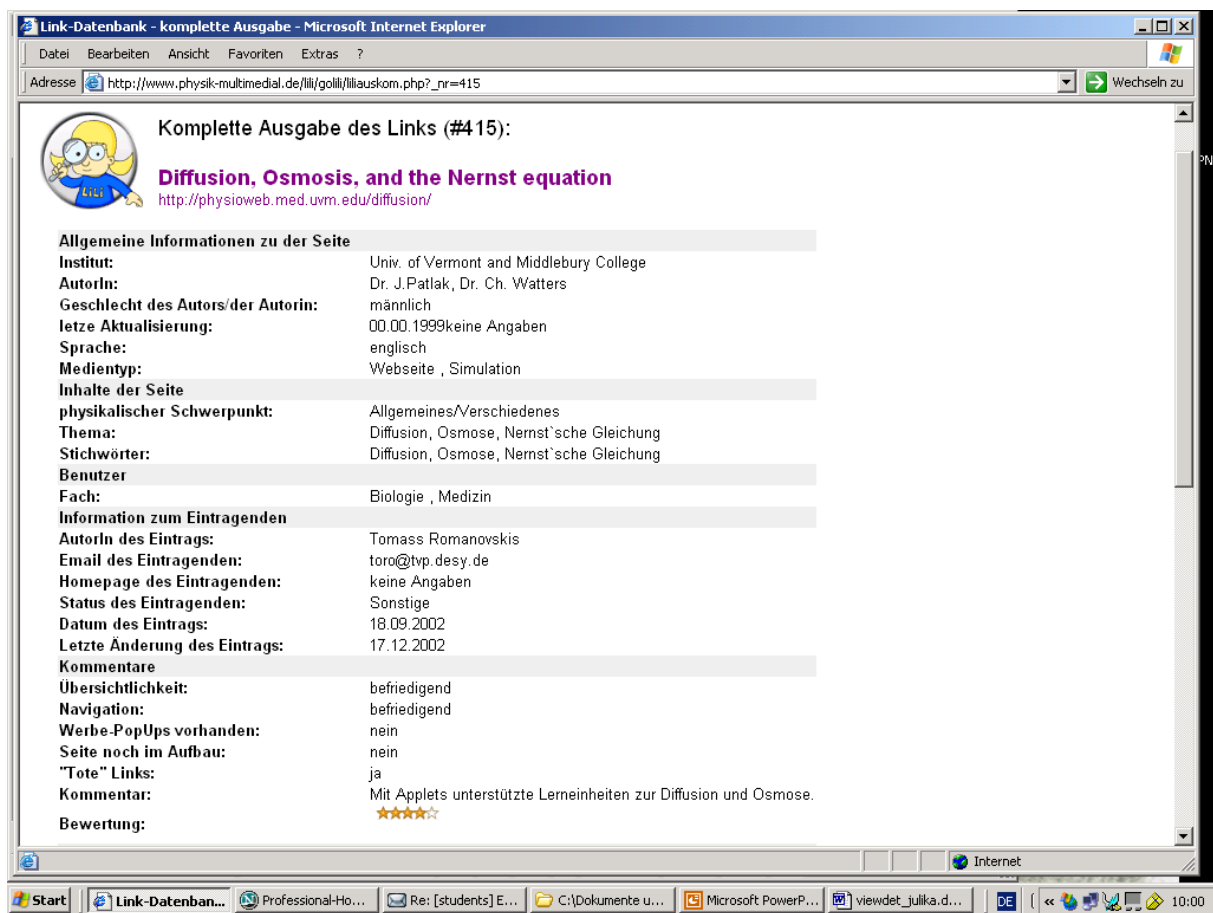


Figure 4: Detailed meta data of an example, also adaptive for medicine

Every author who uploaded a link to the archive is asked to fill in the additional information as well. At the moment (Oct. 2003) exist around 600 entries with meta data which are shown in 2 steps:

1. the title, the URL as text fields, a flag for language, the learned field , the subject, the type of media and comment
2. Further description which can be grouped in 8 main categories see below

- Title, URL as heading
- Information of the ressource : Institute, Author, Sex of author, Language,
- Content of the ressource: Field in physics, Topic, Keywords
- User: User, Subject

- Meta-Meta-Data: Author of DB entry, Date, last updated
- Comments: Clarity, Navigation, commercial-PopUps ex, Thematical errors, page under construction, „Dead" Links, annotation, rating
- Pedagogical criteria: User Behavoir, Kind of material, hints for use, level, Interactivity, dense matter, handling time, coverage of the unit, no. of transdisciplinary examples, area of these examples, introduction, Glossary, no. of formular, amount of descriptions
- Technical data: Size, System, OS Version, System Requirements, Browser, Download, Installation,
- Conditions of use: licence fee, Copyright

As you can image from the extensive list above it is very timecomsumpting to fill out every field. The 'uploader' have to know the material quite well or need competence to review it. As a result only few meta data sets are complete. A user statistic will show later on the keywords and categories which are searched for. Because no subject classifications of the Learned Fields are used like PACS on MSC it is easy to look for material cross disciplinary.

### 3.3 LiLi – the Harvest search engine

The number of clicks you need from an internet page to reach relevant content is called search depth. This search depth, counted from the page that was inserted into LiLi was additionally entered into the data base. A harvest search engine follows all links on the pages inserted into LiLi and saves the content into an index file. This is repeted as often as indicated in the search depth for the individual page. By this, an index file is created with hardy descibed and automatically retrieved links but with a very good signal – noise ratio. It can be searched through with a retrival software. At the moment the index file contains almost 20,000 objects. Automatically, the links are checked weekly and a ranking is implemented as well. A robots is not able to investigate other data bases. This is why we try to exchange data with other data bases, with static html pages or by means of the OAI protocoll.

## 4 Conclusion

In the last 2 ½ years, the project physik multimedial developed a number of technical tools and physics' modules and offers them now on a virtual learning environment. This platform gives lecturers the possibility to enhance their courses in a modern way. The ISN created LiLi. LiLi contains a data base with a few but well defined links to elearning material on physics. The second component of Lili is a search engine, that uses the links of the data base as starting points for the build-up of an index. This index contains a big number of links, but in a lower quality. The project physik multimedial is still under construction. The platform and all modules can be accessed at <http://www.physik-multimedial.de> .

Besides physik multimedial we know only about one other e-learning platform dedicated for physics: LONCAPA [10]. LONCAPA has been created by a group of the Michigan State University.

## 5 Acknowledgement

Saskia Tautz and Ulrike Neeman developed the data base LiLi. The self-study unit has been created by Isabell Schaffer. Christian Schöne is a big help in the operation of the platform. Evelyn Brudler was responsible for organizing the workshops for the female biology students. My special thanks to all of them!

Most of the good ideas are due to Prof. Dr. E. R. Hilf, who is always promoting the project in a provident way.

A close cooperation in the further development of the platform with Helmut Schottmüller (Universität Bremen) is very productive.

Prof. Dr. Horst Schecker (Universität Bremen) has coordinated the overall project in a very effective and competent way.

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