# Teaching Information Literacy with the Lerninformationssystem

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*ABSTRACT German libraries have developed a learning information system to improve information literacy among German students. An online tutorial based on this Lerninformationssystem has been developed. The structure of this learning information system is described, an online tutorial based on it is illustrated, and the different learning styles that it supports are indicated.*

In 2001 scientists of the Sozialforschungsstelle Dortmund Landesinstitut (a federal state institute working in the field of labour research, located in Dortmund, Germany) reported on 'barriers in using digital scientific information at German universities and other institutes of higher education'.[1] They came to the conclusion that information literacy among German students had to be improved, and suggested several measures to be taken, one of them being that

> Courses and learning modules for professional use of digital scientific information must be conceived, developed, applied and assessed. Therefore, intra- and inter-university cooperation of lecturers, libraries and information brokers is absolutely necessary.[2]

In response to these suggestions and in connection with the research funding program 'New media in education'[3] of the German Federal Ministry of Education and Research, the universities of Düsseldorf, Cologne, Hamburg and Dresden have been developing a learning system, initially for medical science. For German universities this system is available for free.

The skeletal structure of the learning system is called Lerninformationssystem (learning information system, below LIS). By contrast with the learning content, which is specific for each subject, the LIS is applicable to all fields of knowledge. In the Heinrich Heine University of Düsseldorf it is currently used for web-based training in medical subjects such as Coronary Heart Diseases[4] (which it was originally developed for), classes on social sciences or digital photogrammetry.

When Düsseldorf University and Regional Library (ULBD) decided to create a learner's program to promote the acquisition of information literacy, particularly for the newly developed BA and MA curricula in accordance with the Stefi-Studie,[5] it settled on this program, LIS.

Consequently, in the summer of 2004 ULBD started working on an online tutorial based on LIS featuring self-determined learning via a highly flexible and self-organized modular tutorial architecture. It is intended both for self-study via the internet and as a method in blended learning.[6] The authors (both

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librarians at the ULBD) assume editorial responsibilities for the learning content as well as technical feasibility.

E-learning moves the learning experience out of the traditional classroom and into the learner's world. It allows learning anytime and anywhere without geographical or scheduling limitations, being based on the internet for access to learning materials and interacting with experts and fellow learners.[7] Moreover, since the goal of the project is to help students to access digital information, the applicability of Ahmad's first proposition[8] about the effectiveness of virtual learning environments is evident:

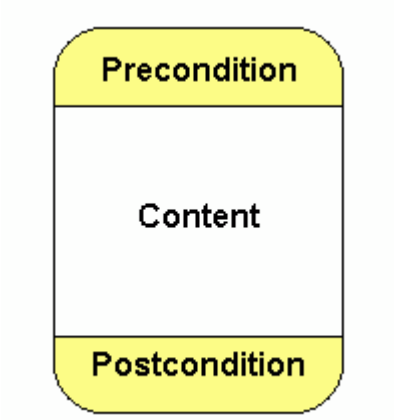
> Virtual Learning environments are more effective than traditional learning environments regardless of the learning model employed.

## Theory

LIS is a modular system based on the Hoare Triple.[9] A triple describes how the execution of a piece of code changes the state of the computation. The Hoare triple is an aspect of Hoare logic[10] and makes the following case:

**Figure 1**
**The Hoare Triple**

P {Q} R




It defines the process of transformation as divided into three parts: the precondition (P), the transition (Q) and the postcondition (R), where P is the learner's knowledge which is to be transformed through learning {Q} into the status R. This means that the author has to consider both the learning target and his or her previous level of information or knowledge at the same time.

## The Composition of LIS

The learning content is subdivided into modules. Each module should contain learning content on a small scale of approximately 10 to 15 minutes working time. A module consists of three components, following the Hoare triple as mentioned before.

The content that is visible to the learner is written in the module's body. For this all media that can be accessed via the internet or intranet (for example PDF, MP3, Flash) are appropriate. The content has to be provided in XML. There is a specially developed editor for designing LIS modules, but in principle any XML editor can be used. XML allows the LIS to present the same content in different scenarios very easily. Besides the body, modules consist of the pre- and postcondition. For their verbalisation thesauri are applied. These thesauri have to be structured collections of standardised terms or descriptors.

Descriptors are chosen and enlisted in a thesaurus by the authors. To ensure a fully functionable system, this thesaurus has to be well defined. Otherwise the postconditions could potentially not correspond to any further preconditions to complete a sequence of modules.[11]

By means of preconditions and postconditions the modules form a network. They are linked if the postcondition of one module and the precondition of another one contain the same components. This networking displays two characteristics:

- On the one hand it is dynamic. This means that it is not necessary to maintain explicit references between modules. After a module's cancellation it is not available for networking anymore and there is no reference which could still lead to this module. So terms and logic descriptions are alterable.
- On the other hand it is symmetric. By contrast with hypertext-based systems the LIS allows implicit references. An author can refer from one module to another, but also actively have a reference made to his module.

The system differentiates between knowledge modules and question modules. The precondition of knowledge modules specifies which previous knowledge a user needs in order to understand the learning matter of the main part. The postcondition defines the increase of knowledge.

Similarly, question modules are composed. Their precondition describes the knowledge which is asked in the main part, whereas the postcondition is set dynamically by the user. By answering questions, the learner reveals his knowledge or lack of knowledge. Consequently the system offers the knowledge modules which are helpful to make good the deficiency.

The system records the individual's learning progress. For this purpose the terms from the postconditions of knowledge modules that the learner worked through are saved. This set defines the learner's 'previous knowledge'.

'Knowledge' is not only defined by the postconditions of the learned knowledge modules. It can also be modified by the learner's success in answering question modules. If the answers are correct the relevant postcondition terms are added to the learner's 'previous knowledge'.

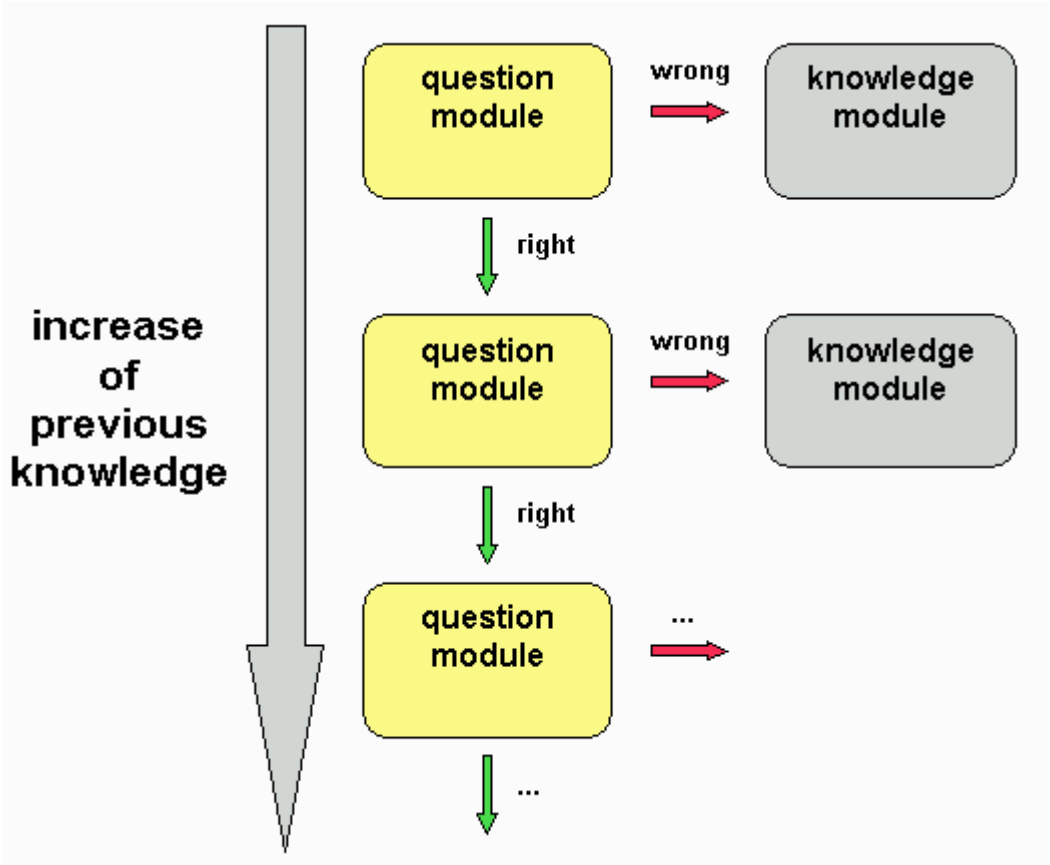
## Practice

The learner can use the resources of the LIS in different ways.[12] It is possible to access several thematically-structured modules and compile the learning contents individually, or to work one's way through via author-defined courses.

A dynamic learning scenario is the standard learning situation in LIS. A learning target is declared and the system – corresponding to the learner's previous knowledge – determines a sequence of adequate knowledge modules.

Using LIS as a question-based learning system can be interesting for exam preparation. In this case only question modules are accessed. Every false answer reveals the learner's need for explanation. In this case LIS proposes modules which the learner can work through to close the gap between his previous knowledge and his need for explanation.

**Figure 2**
**LIS as a Question-Based Learning System**




For beginners, defined static tutorials are particularly suitable. The authors of the tutorial combine modules with a specified learning target in one tutorial. In that case the description of the modules by preconditions and postconditions is irrelevant. Instead the order of working units is predefined. Because the learner will not be confronted with problems of navigation, it is the easiest way of using the contents in LIS. The static tutorials can also be used outside of LIS.

The learner can also freely choose and combine any modules without explicitly defining a learning target. The post-conditional terms are added to the learner's previous knowledge as usual.

## Perspective and Conclusion

In the future LIS will be used for the purpose of information literacy in several scenarios. For a start, static tutorials will be implemented into the web sites of the ULBD. The module covering catalogue usage will be published soon. Step by step a complete course featuring all aspects of information literacy (based on the *Big6*™)[13] will be released. The materials will be accessible online so users can work in a self-directed way. Blended learning – the hybrid of classroom and online learning – becomes increasingly important in higher education, another area of application for LIS. For example, it will be used to support classes on information literacy which ULBD is offering to students and university teachers.

As soon as the realisation has taken place in practice, there will be a multi-level evaluation. All participating groups will be included: students, librarians and professors of diverse faculties. The evaluation form will be part of the LIS itself.

LIS is perfectly suited to support these scenarios. It is independent of place and time and highly flexible, both for learners and authors. The learner's needs are served much better in this way, and the learning process is more efficient than it could be with the help of static-only tutorials. Especially for students, the flexibility of LIS is an important advantage. Information literacy is not a major subject, but an interdisciplinary extra qualification and a basic skill for life-long learning. So students don't need to neglect their studies, but can improve them by freely scheduling information literacy whenever they want.

The composition of LIS offers also some advantages for authors over other completed static-only tutorials. It features easy maintenance, for example concerning supplements, changes or textual updating and cancellation. Networking by preconditions and postconditions keeps LIS dynamic and allows different ways of access and evaluation. Compared to other e-learning environments in the German market LIS has the crucial advantage of giving the opportunity for personalized learning. The individual learning process is recorded, through which an individual efficiency control is possible. This makes LIS unique on the present market of learning information systems.

### Notes

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2 ibid p12

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4 German: Koronare Herzkrankheiten, at http://www.khk.uni-duesseldorf.de/
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6 T Kaye *Blended Learning: How to Integrate Online & Traditional Learning* London Sterling Kogan Page 2003
7 http://www.ucalgary.ca/cted/elearn/
8 R Ahmad, G Piccoli and B Ives *Virtual Learning Environments: An Information Technology Basic Skills Course on the Web* Association for Information Systems 1998 Americas Conference, at http://delivery.acm.org/10.1145/360000/353094/p352-ahmad.pdf
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13 'The Big6™' is an information literacy model, sometimes described as a metacognitive scaffold, or an information problem solving strategy: see http://www.big6.com/