

## SelMa – New Perspectives for Self-guided Learning in Teaching Mathematics at Senior High School Level

Wolfgang Weber and Kristine Fankhänel

*Landesinstitut für Schule und Weiterbildung, Paradieser Weg 64, D-59494 Soest, Germany  
wolfgang.weber@mail.lsw.nrw.de*

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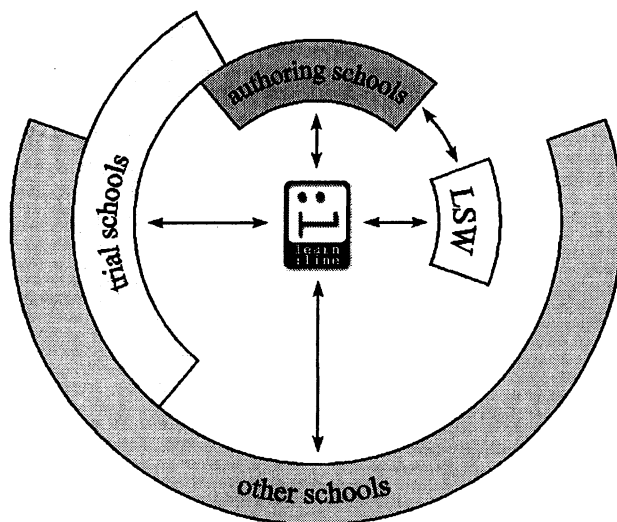
**Abstract:** How can new media make the teaching and learning of mathematics more exciting? How can school prepare for lifelong, self-guided learning? It is questions like these that the project 'SelMa – Selbstlernen in der gymnasialen Oberstufe – Mathematik', which is supported by the Federal Republic of Germany and the state of North Rhine-Westphalia, addresses. The aim of the project is to show ideas and possibilities for the ways in which mathematics can be taught if student activity and self-guided learning are supported, and how the idea of self-guided learning in general can be integrated into daily school routine. SelMa is run in close co-operation with schools.

### 1. GENERAL INFORMATION

The pilot project 'Selbstlernen in der gymnasialen Oberstufe – Mathematik' (SelMa) is one of 25 pilot projects taking place in Germany within the framework of 'Systematic Incorporation of Media, Information and Communications Technologies in Teaching and Learning Processes' (SEMIK). The aim of the SEMIK programme is to support the permanent integration of new media in all types of schools and at all levels. SEMIK includes various projects that make use of new information and communications technology. New media are to be integrated in teaching and learning processes and to help to put into practice innovative concepts of

teaching. The main focus is upon problem-orientated, self-guided and co-operative learning.

The four-year SelMa project, which is funded by the federal government and by the state of North-Rhine-Westphalia, started on February 1, 1999.



*Figure 1. The SelMa structure*

SelMa is monitored by the LSW (State Institute for School and Further Education). The aim of the pilot project is to show what teaching mathematics at senior high school level can look like if self-guided learning and activities are supported by the use of new media. Special importance is placed on integrating aspects of self-guided learning in everyday teaching.

Learning, mathematics and the use of new media – these are the pillars on which SelMa stands. Special emphasis is placed on the delivery of the new curriculum for mathematics, which focuses upon aspects of self-guided learning and must be integrated in everyday school life. The purpose of SelMa is to give teachers orientation and impulses for their own teaching.

Scenarios and materials for self-guided learning phases in teaching mathematics at senior high school level are being developed in five 'authoring schools'. These learning arrangements are accessible for teachers for trial purposes on the North-Rhine-Westphalian web-site 'learn:line'. learn:line provides an information, communication and co-operation environment for this purpose. Pupils can contact a 'teacher on demand'. learn:line also encourages the exchange of information and experiences between teachers, and initiates discussions with experts.

The development of materials by the authoring schools is to take place in an 'open workshop', so that other schools can also try out them at an early stage and regularly report on their own experiences. A special role is played by ten 'trial schools' which systematically try out and evaluate the materials which have been developed to see whether they work in everyday usage. Their feedback will be incorporated in the on-going development of materials.

Furthermore, authoring and trial schools are to disseminate their practice so that networks of schools can be created in the different regions and the materials on learn:line can be further developed. In this way the scenarios will be used in an increasing number of schools. Publishers are to be included at an early stage. This is expected to lead to high-quality (offline and online) media which will support phases of self-guided learning in teaching mathematics.

## **2. IMPORTANT ISSUES**

Based on the focus upon learning, mathematics and use of media, the pilot project addresses various issues. The work of the authoring schools is monitored by academics and experts. Some of the aspects of methodology that are pertinent to learning/self-guided learning are:

- Which topics are suitable for phases of self-guided learning?
- How must the topics be presented?
- What different kinds of support do teachers need?
- What different kinds of support do pupils need?
- How can progress in learning be monitored?
- How do pupils acquire and use their knowledge?
- How can knowledge be consolidated by means of intelligent practice?
- How are media used by pupils?
- How does the use of media improve the quality of learning?
- What off-line and on-line materials must be provided?
- How can communication between the pupils be encouraged?
- What kinds of support are requested?
- What role does a 'teacher on demand' play?
- What opportunities for co-operation exist?

These questions show the broad range of issues the SelMa pilot project addresses. The measures taken to qualify teachers so that they can profitably incorporate both the individual learning process and the use of new media in their teaching should not be forgotten, either.

### 3. WEB-SITE

The current state of affairs can be viewed on-line on the NRW educational web-site learn:line (<http://www.learn-line.nrw.de/angebote/selma/index.htm>). The web-site offers a wide range of opportunities for information, communication and co-operation in the fields of self-guided learning, mathematics and use of media.

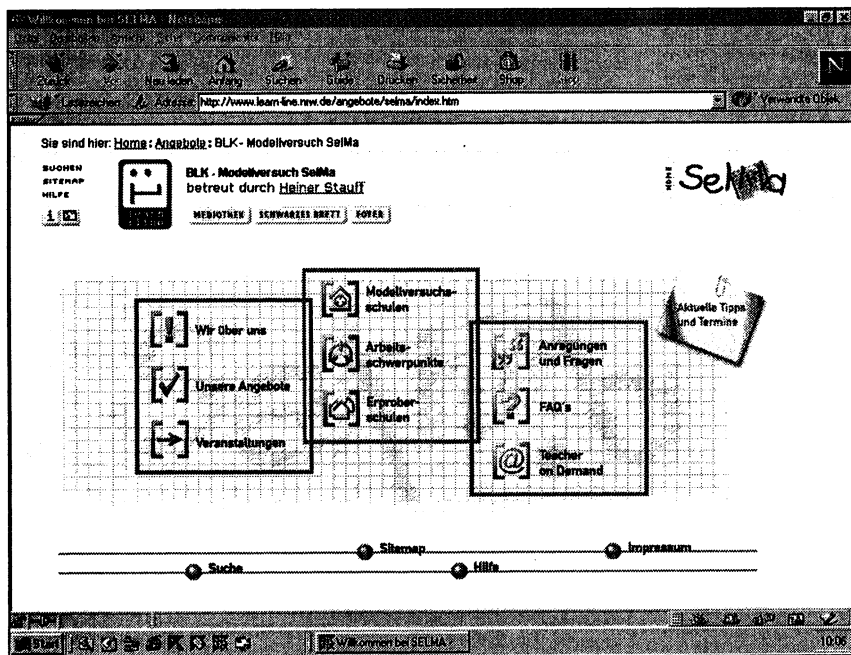


Figure 2. Home page of the SelMa web-site

The contents of the SelMa web-site are arranged in three blocks which are marked in different colours.

The left-hand 'red block' contains information which the SelMa-LSW team has compiled. This is where general information can be found on the pilot project as well as material on the topics of self-guided learning, mathematics, use of media. In addition to transcripts of talks, this section also offers references to literature, software and internet addresses.

The right-hand 'green block' offers a wide range of opportunities for communication which are supported by the 'teacher on demand'. For questions and suggestions relating to mathematics and self-guided learning

users can have a look at the FAQ section. Of course, users can also leave their own messages on a message board.

The 'blue block' in the centre is linked to information about and from SelMa schools. This is where the pilot schools present information on themselves and their projects. Up to now five authoring schools have developed projects for Year 11, and additional projects will be following soon.

## **4. PROJECTS**

The self-guided learning scenarios and materials which are being developed by the authoring schools are at the core of the SelMa. Various models of self-guided learning have been used as a basis. Materials for use in self-guided learning centres, collections of exercises for use in everyday teaching, and suggestions and materials for learning at stations using different approaches are included. Each project is accompanied by a project description.

### **4.1 Materials for the independent learning centre**

The work of a SelMa authoring team is closely related to further developments in their school. In an independent learning centre, pupils work on their own, on mathematical topics specified in the curriculum for Years 11 and 12. The material which is prepared for the independent learning centre consists of courses on the one hand and of collections of problems on the other. Graded aids for learning relating to the pupils' existing knowledge provide both food for thought and initial approaches towards solving the problems. Suggested solutions to the problems allow the learners to check the progress they are making. The computer provides opportunities for simulation and visualisation of mathematics.

Pupils normally meet in groups of two or three in the independent learning centre and discuss individual problems. The aim is for the individual pupil to establish as precisely as possible those areas where practice is most necessary. Under no circumstances must the pupil's personal speed of learning suffer from group pressure.

In practice it has been found that pupils can contribute a lot of help and suggestions when it comes to designing the materials. In further projects, pupils who are already experienced in using the materials should be involved even more closely as co-designers.

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