A Collaborative Lab- and Learning Environment for a Virtual Database-
Practical at the Virtual University

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Abstract
This paper introduces an authentic learning environment with an as well authentic database laboratory for collaborative distance teaching. We developed and established a three-server-environment for a new type of database practical that is in its first testing cycle. It offers an environment capable of providing all the services that would be needed for a practical that requires a whole semester but no physical presence of the student. Bearing in mind the special requirements of distance education we tried to develop an environment to realize our didactical goals. On the one hand the environment consists of an administration and communication environment: The virtual university that provides access to and information about the course. On the other hand we provide the groupware environment BSCW (Basic Support for Cooperative Work) for shared documents and further communication. The laboratory component is an ORACLE instance with team-accounts accessible via the iSQL*Plus browser interface.

Introduction
Approx. 50,000 students study at the FernUniversität Hagen (Distance Teaching University), most of them work or bring up children and are thus very dependent upon the benefits of distance education e.g. time and location independency [1].

The Virtual University (VU) was developed to fully integrate the advantages that the internet offers to learning communities, and is Germany’s first university that offers all its services on the internet. It started as an online learning project and has now developed into a large platform with roughly estimated 15,000 students participating and more than 200 learning events online [2]. Even seminars and practicals have been integrated in the VU and students are given the opportunity of participating in highly communicative tutoring events like these [3].

We describe a further development in the field of internet-based practicals. Currently we are developing and testing an environment in which students can fully participate at the database-practical, working in teams without ever meeting physically.

Conventional vs. Virtual Practicals
In order to document the different needs of practicals in present and distance education we will shortly describe the similarities and fundamental differences between these types of practicals.

Conventional Practicals at the FernUniversität

Like other universities, the FernUniversität offers practicals in various subjects like electrical engineering or technical computer science. Students travel from all over Germany to Hagen to participate. These practicals require some days up to several weeks. Some of the participating students are forced to take all their leave days from work for one year to attend.

Conventional Practicals at campus universities

Practicals at a campus university usually require at least half a day per week and typically last one or two semesters. These practicals consume much of the students working and learning time. Conventional practicals are a strain to students and a severe problem especially for students in distance education, because both basic requirements of remote studying, i.e. time and location independency, are not fulfilled. Of course it seems difficult to convert practicals like in organic chemistry or physics [7] into virtual practicals where haptic or olfactive abilities are a learning target.

Virtual Practicals at campus universities

Practicals were partly virtualized in several ways, using telemetries, avatars or visualizations e.g. [4]. As students of campus universities have no restrictions in choosing learning locations, these practicals often refer to limited resources, like corpses in anatomy.

At the University of Dortmund, Germany, attempts have been made to establish a "theoretical" in teaching Special Relativity to visualize near light speed [5] because of the evident impossibility to let students personally experience the sensation of approximating the speed of light.

Virtual Practicals at the FernUniversität

At the FernUniversität tutors are aware of their students’ problems in participating physically. Thus some practicals have been partly virtualized, e.g. the software practical, in which students develop large software solutions in distributed group work. They use the communication facilities of the VU during the semester, but still have to attend physically at two events in Hagen lasting.
about 2 to 3 weeks altogether. We introduce an environment for a practical carried out in group work, where no physical presence is necessary and the need of synchronous communication is reduced to a minimum.

**Prerequisites for a virtual practical in distance education**

Students in distance education demand time and location independent learning and are usually not well equipped with hard and software. Thus we cannot expect them to install huge software packages on their own computers or to pay for an M-Bone or ADSL connection to the internet because of the comparatively high expenses for these technologies in Germany. Thus we are limited to quite basic hard and software conditions. Universities have limited pecuniary resource too, so licence costs especially for DBMS have to be taken into consideration. Still the laboratory environment should be as authentic as possible. Tutors haven't got unlimited time and energy when it comes to supporting the students and to keep an eye on students' activities. And finally the administration of the university has their own requirements in administrating the activities and prosperities of students in a virtual university. These administrative necessities that both administration and tutors are subject to are mostly carried out via the Virtual University Platform as well as the communication [6]. For the other prerequisites additional features have to be included in an environment for a virtual practical.

**Building a lab and learning environment**

Bearing in mind these prerequisites a learning environment for a virtual practical consists of three basic components. As the first component ther is the administrative and communication platform, the VU. All administrative demands (e.g. to enrol) are carried out via this platform as well as several communication tasks and information about the topics and the organisation of the practical itself. The second component is a groupware tool in which students can organise their distributed work. We chose BSCW as it requires only a browser on client side and is easy to use. Students are requested to store shared documents on this server. The third component is the database laboratory itself. We chose ORACLE because it is one of the most widespread and most commonly used DBMS.

As we could not demand of the students to install an Oracle Instance or even a client on their computers, we decided to use ISQL*Plus – a browser-based interface comparable to the interface described in [8].

We created group-accounts in one particular ORACLE instance, so the members of the groups would be forced to communicate and agree about any actions carried out against the database. This way the didactic requirements which we demanded for a practical – authenticity, group work and problem and student orientation - are supported by the learning environment itself. How these didactic demands are represented in the conceptual formulation will be discussed in a future publication.

A three-server-environment is used for the practical: The students gain access to the VU Server and the course “Database Practical” with its information and topics website. Via the VU they access the BSCW-Server with the team-folders and the shared documents as well as they access the database server with the browser interface.

We are positive that it is possible to put into practice a database practical requiring a whole semester with this learning environment. This means without students ever having to be physically present at the university, and with very few synchronous communication events, apart from one or two occasional online chats.

**First Experiences**

Beginning of April 2002 a first attempt to carry out a database practical in the way described above has started with 45 students participating in 9 teams supervised by three tutors. The practical is being evaluated by a group of pedagogical psychologists at the University of Mannheim.

So far we can say that the learning environment is being used intensively. Some suggestions for improvement and very few complaints have been made by the students. Many students consider the environment very useful and easy to use. The results are encouraging so far and the students especially point out its advantages for distributed group work. Further evaluation is still to come as these impressions are merely subjective.

**References**