Network of Excellence PROLEARN

Transforming Technology Enhanced Learning

How can companies, especially small and medium sized enterprises (SME), receive support and benefit from technology enhanced learning scenarios? How can we bridge the gap between research and application of technology enhanced learning (TEL), which often delays successful innovations in continuing education programs? Which directions will technology enhanced learning take in the future? The PROLEARN Network of Excellence is funded under the Sixth Framework Programme of the European Union to answer these questions.

Facilitating innovative technology enhanced learning scenarios successfully in a variety of environments is a major PROLEARN goal. New kinds of interactive media and videoconferencing environments as well as simulations and hands-on experiences in online and virtual laboratories make learning more effective. Techniques to personalize content will individualize the learning experience. Advanced distributed and peer-to-peer infrastructures will support sharing and exchanging learning materials without centralized servers or administration overheads. Standardized descriptions of interfaces and learning resources will enable the simplified and automated access.

Integrating knowledge work and learning is the key to support human resource management and company profile development. Specialized business models and processes integrate lifelong learning into the work process and build a viable infrastructure of e-learning technologies, service and content providers in Europe. Outreach to industry is facilitated in the PROLEARN Virtual Competence Center while the PROLEARN Academy interfaces with worldwide research.

PROLEARN started in January 2004 with a budget of € 6 Mio., running for four years and integrating more than 150 partners worldwide. This growing group of associated partners includes global players like Microsoft and IBM as well as a large number of small and medium sized enterprises like im-c AG, the Klett Publishing House and universities like the Stanford University with the Stanford Center for Innovations in Learning and Carnegie Mellon University.

PROLEARN collaborates closely with other European, international and national projects. Activities are strongly interwoven with other projects like the Network of Excellence KnowledgeWeb and REVERSE in the area of the Semantic Web as well as with the Integrated Projects E-LeGI and iClass focusing on technology enhanced learning. PROLEARN is present at fairs like Online Educa 2004 in Berlin, Learntec 2005 in Karlsruhe and CeBIT fair 2005 in Hannover as well as at the IST Event 2004 in Den Hague, and at a large number of scientific conferences, e.g. the World Wide Web Conference or ED-Media. See the website www.prolearn-project.org for an up-to-date list of PROLEARN events or contact Dr. Martin Wolpers (wolpers@l3s.de).

Executive Director Wolfgang Nejdl talking about the L3S Research Center

What is the L3S Research Center?
The L3S is a center for theoretical and applied research on information, learning and knowledge technologies. We develop innovative solutions and apply them in academic and business environments. Our most important research areas include Educational Technology, Semantic Web and Digital Libraries, Industrial Informatics, Distributed Computing and Networks, and Grid Computing.

The Research Center was established in 2001 as a joint initiative by several universities and today connects research groups from the University of Hannover, the Hannover Medical School, the Technical University of Braunschweig, the Braunschweig School of Arts and the University of Kassel.

How is your work funded?
Initiating the L3S Research Center was made possible by substantial funds from the federal state of Lower Saxony and the Federal Ministry for Education and Research (BMBF) in 2001-2003. Now, in 2004, our annual budget is about 3.5 Mio Euro, more than 50% of which are external research and development grants. We have more than 70 women and men working for the L3S, half of them are Post-docs or PhD students.

Can you describe some international collaborations of the L3S?
We participate in the E-Change project on Technology Enhanced Learning (funded by the Sixth Framework Programme of the EU), as core partner in the KnowledgeWeb and REVERSE Networks of Excellence in the area of Knowledge Technologies and Semantic Web, as partner in the EURON (Robotics) network, in the Wallenberg Global Learning Network (WGLN) and numerous other projects and co-operations. And we are active in the organization of the most important conferences in these areas, this year, for example, the International World Wide Web Conference in New York and the International Semantic Web Conference in Hiroshima.

What about consultancy and technology transfer?
Our tasks also include consulting and technology transfer in all areas mentioned before. The L3S Research Center is actively involved in the eLearning Academic Network Lower Saxony (ELAN) and attaches a great deal of importance to the development of applied research and to the creation of sustainable networks with regional companies. We also collaborate with German and international standardization bodies. Together with our focus on research excellence, these activities help industrial project partners to take advantage of the latest research results and use them to their advantage in innovative business solutions.

Charting the Future

How can professional education benefit from mobile adaptive learning technologies? How do learning technology standards enable scalable environments? These and other questions are the focus of the annual PROLEARN Thematic Workshop series, providing a public forum to address relevant issues for technology enhanced learning. Distinguished experts from research and industry will provide insights into the important research questions and into the future of technology enhanced learning. Participants from all over the world, from research organizations and as well as large companies will come together to identify and discuss how to best address future e-learning scenarios.

The first PROLEARN Thematic Workshop, organized by the L3S Research Center, will focus on professional learning for the learning organisation. Embedded in the presentations of technology enhanced learning environments is a major PROLEARN goal. New kinds of interactive media and videoconferencing environments as well as simulations and hands-on experiences in online and virtual laboratories make learning more effective. Techniques to personalize content will individualize the learning experience. Advanced distributed and peer-to-peer infrastructures will support sharing and exchanging learning materials without centralized servers or administration overheads. Standardized descriptions of interfaces and learning resources will enable the simplified and automated access.

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“Metadata, Standards and Interoperability” will be the theme of the second PROLEARN Thematic Workshop. Combining worldwide efforts towards interoperable technology enhanced learning environments enables a truly networked learning experience and individualized learning experiences tailored right to the single learner. K.U. Leuven will host the work-shop, which will be organized by the Ariadne Foundation in early March 2005 in Leuven, Belgium.

The first workshop will take place right after the PROLEARN General Assembly on November 4 and 5, 2004 in Hannover, Germany. For more information, please see: http://www.l3s.de/prolearn_tws2004.
The PROLEARN Network of Excellence benefits from the advice of its Industrial Advisory Board, chaired by Prof. Dr. Christoph Strutz. The board includes the leading experts in human performance improvement, knowledge management, learning and training technology, with over 10 years of experience in business and education. Wayne has developed thought leadership and visionary perspectives on how learning, technology, and standards can revolutionize workforce productivity.

As a Strategic Futurist, Wayne serves as a strategist and advisor to various international industry and government groups. He is a member of the Industrial Advisory Board of PROLEARN and as such has shared some of his visions with Dr. Christoph Strutz, Managing Director of the L3S.

WH: In the grand scheme of things, I believe that whatever the term “e” stands for, it is the shift from treating people on a mass scale such as everyone who has some well-defined role in an organisation, or everyone who has the same job description and instead taking this down to a micro scale by focusing on each and every person as a unique individual, and doing so each and every day. Going from a single mass market the way HR often views it, to a market of one (individual) and an infinite number of markets.

L3S: What can you explain a bit more about what you mean by “me-learning”?

WH: Not at all! First two comments on the revolution and changes in technology: it is an evolution not a revolution and it is evolving exponentially. I suspect that we have lost our perspective on technology. We are erroneously seeing “technology” as a recent phenomenon and we only see this as computer or information technology. My point is that technology includes much more than computer or information technology and is something that we’ve had since the wheel and lever. Seen in this way, technology is much more of a long term and continuous evolution. Recently, in the past 10 years or so, there has been a rapid rise in the awareness of technology, and the perception that we are at the beginning of a revolution. What is really happening is that this evolution, like most any given individual needs and situation. This kind of mass customisation or personalisation enables a different solution for not only every country but every individual me-learning!

L3S: Technology has dramatically changed over the years, but is this the end of the revolution?

WH: It is not so much a matter of “keeping up” with technology as I don’t think technology itself has much impact on learning. What I WOULD like to see learning match in regards to technology is innovation! From my perspective we have paid very little attention to pedagogy at all for literally hundreds of years and as a result we have seen almost no change that I can see in the effectiveness of learning. In- novation in learning? Notably absent! Whiteboards instead of blackboards? Textbooks and learning materials on computer screens instead of on paper? Virtual classrooms? At best these are applications of new technologies to very old pedagogical practices.

I am particularly struck by the almost complete lack of attention to the radical changes required to our thinking and practices of teaching, instruction and how to best help others learn. In my work around the world I find an almost universal consensus about the radical shift to a very learner centric model of learning. However there appears to be almost no discussion or consideration about how this will require an equally radical shift in the instructional models, teaching methods and overall pedagogy to effectively support learner centric learning. As a result I think we are still at the very earliest stage of the revolution and evolution in learning and also very early in seeing the benefits this will all bring. In the future we will see the realisation of the vision where it is the shift from treating people on a mass scale such as everyone who has some certain role with in an organisation, or everyone who has the same job description and instead taking this down to a micro scale by focusing on each and every person as a unique individual, and doing so each and every day. Going from a single mass market the way HR often views it, to a market of one (individual) and an infinite number of markets.

WAYNE HODGINS is recognised around the world as a strategic futurist and one of the leading experts on human performance improvement, knowledge management, learning and training technology. With over 30 years of experience in business and education, Wayne has developed thought leadership and visionary perspectives on how learning, technology, and standards can revolutionize workforce productivity.

L3S: What does this mean to companies and their human resource development plans?

WH: Ah, now we are talking about the true revolution! For human resource development this means the complete reversal and inverse of most of what we have traditionally understood. This will include the shift from trying to provide everything for everyone in what might be called the “just in case” model, to what I often refer to as the “just the right” model. This would be about finding the right person and just in time to just the right person. In other words it is the shift from treating people on a mass scale such as everyone who has some well-defined role in an organisation, or everyone who has the same job description and instead taking this down to a micro scale by focusing on each and every person as a unique individual, and doing so each and every day. Going from a single mass market the way HR often views it, to a market of one (individual) and an infinite number of markets.

L3S: How will pedagogy have to change to keep up with technology?

WH: It is not so much a matter of “keeping up” with technology as I don’t think technology itself has much impact on learning. What I WOULD like to see learning match in regards to technology is innovation! From my perspective we have paid very little attention to pedagogy at all for literally hundreds of years and as a result we have seen almost no change that I can see in the effectiveness of learning. In-innovation in learning? Notably absent! Whiteboards instead of blackboards? Textbooks and learning materials on computer screens instead of on paper? Virtual classrooms? At best these are the applications of new technologies to very old pedagogical practices.

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Our Interview and the willingness to share your visions of learning with us.

WH: Thank you very much for this opportunity to speak with you and share some of my thoughts on the future of technology, learning and how performance improvement. I look forward to seeing you all in Hannover.

L3S: Mr. Hodgin, thank you very much for this interview and the willingness to share your visions of learning with us.
Semantic Web

Improving Access to Information

You have a problem? The internet has the answer – or almost. Maybe you have tried already to search for an island named Java, and wondered why you got pages about a computer language. Or your child has searched for the most important composers of the 19th century for his school project, and had trouble finding useful pages. Most searches done in Google today consist of one word or two word queries, and while you know what you are searching for, today’s search engines can neither take your interests into account nor can they judge whether a page containing the word “Jaguar” talks about a car, an animal or an operating system from Apple.

Over the last years, the World Wide Web has been developing at an incredible rate into an information medium that is an integral part of our lives and business, yet efficient and effective search on the internet is still far from perfect. The reason is the difficulty for computers to understand the information available on the World Wide Web and their inability to take a user’s search context into account: the syntactic structure of information available on the Web is standardized, but the utilization of additional semantic information and context is not. The Semantic Web will make this semantic and context information available attached to the original data – as Semantic Web metadata – and will utilize it to allow more precise and effective search both on the Web and on the desktop. Key to the vision of the Semantic Web is a standard for representing these metadata (RDF), the ability to express background knowledge in a machine understandable format such as RDFs and OWL ontologies, and the ability to automatically create and extend these metadata from a variety of sources. In order to research and develop theory, tools and innovative applications for the Semantic Web, the EU made projects dealing with knowledge technologies and the Semantic Web a central part of its research program.

The LfS Research Center was successful, together with partners from all over Europe, in its application for two Networks of Excellence to advance this new generation of the World Wide Web. The Networks of Excellence – KnowledgeWeb and REVERSE – bring together the work of fifty first-class research institutes from all over Europe, funded by the EU with a total budget of over € 12 Mio. for the next four years. This will enable the integration of extended and intelligent functionalities for the Next Generation Web, to improve the retrieval and re-use of information on the Internet, company intranets as well as on every desktop. The main focus of the LfS in these projects is on distributed peer-to-peer information infrastructures, the contextualization and personalization of information retrieval, and the security mechanisms necessary in such networks. The results will enable us to dynamically network and integrate a variety of (possibly distributed) data sources and to make sophisticated web service interfaces and the corresponding search mechanisms available. Selection and presentation of the data available in these networks can be adapted to the needs of users and user groups, contextualized information retrieval and presentation becomes possible, and personalized links provide customized information and advice. Decentralized and scalable security and trust algorithms ensure that even in such dynamic networks, in the end, data are viewed only by authorized users, without having to create centralized registration mechanisms.

Additionally, the LfS will, in collaboration with its partners, build a comprehensive Semantic Web Educational Portal to provide the necessary means for university and continuing education programs focusing on the Semantic Web. Using the EduSecure Brokerage platform and the ARIASyne infrastructure, this portal will enable the network partners, under customizable licenses, to distribute a large number of courses, teaching materials, and best practice examples on the subject of the Semantic Web, as well as on the necessary background technologies. Within the next four years, searching for information will become easy, efficient and effective, whether on the Web, company intranets or on the desktop – thanks to the Semantic Web and advanced search and data integration technologies.

Edutella:

Peer-to-Peer Computing for the Semantic Web

Metadata for the World Wide Web is important, but metadata for peer-to-peer networks is absolutely crucial. The open source project Edutella combines Semantic Web and peer-to-peer technologies in order to make distributed repositories possible and useful.

The Edutella network infrastructure builds upon the exchange of RDF metadata, with the query service as one of the core services of Edutella. The Datalog-based Edutella query exchange language (QEL) and the corresponding Edutella Query Model (EQM) facilitates distributed queries over the Edutella network as well as distributed reasoning in this network. Routing is based on a HyperCup-based super-peer backbone as well as additional indices to optimize routing.

This architecture allows us to build distributed and decentralized information systems which allow new information providers to dynamically extend the existing network without any centralized registration process, while at the same time guaranteeing efficient access to all information available in the network.

The Edutella infrastructure is used in a variety of projects, one example is its use in the EU/IST project ELENA to connect distributed learning repositories.

Further Information:
- http://edutella.jota.org/
- http://www.sena-project.org/
Contact: Peter Dolog
E-mail: dolog@l3s.de

References:

Dr. Jörg Diederich
E-mail: diederich@l3s.de

Semantic Web for Teachers

THE CHALLENGE | Cornelsen, one of the most innovative school book and multimedia publishers in Germany, offers an internet portal providing learning materials for teachers. Conventional searches like “All materials related to the word ‘Goethe’” are not sufficient for their customers, who often want to extend their search specifying what they really need: whether certain results they are looking for, whether it should be used in a German or English class, etc. Clearly, search functionalities relying on additional metadata information were needed for this application scenario.

THE SOLUTION | We decided to apply Semantic Web ideas and technologies to structure and annotate the large number of learning objects available at Cornelsen. The main goal of using metadata about the learning objects Cornelsen offers was to enable semantically richer searches to find relevant information. The representation of these metadata relies on standards like the IEEE Learning Object Metadata (LOM) standard and the W3C Resource Description Framework (RDF), which ensures a high grade of compatibility to other systems and modules, and will make it possible to further extend this solution beyond our initial search scenario in the future.

THE RESULT | Let’s get back to our search regarding ‘Goethe’. Our system provides access to learning materials like books or CDs which have been annotated using specific attributes following the LOM-standard (e. g. level of difficulty, as appropriate for schools). The new system knows different kinds of objects which are annotated using ‘Goethe’ information, e. g. a biography about the life of Goethe, works written by Goethe for use in an English or German class, etc. Furthermore, the system uses typed relations that offer more than the simple links we know from the current Web.

Typed links have a meaning, so we can distinguish references to an exercise book or to supplementary information for the teacher how to use the material in class. These typed links can also be used in search (“Show me all exercise books for German grammar books”). Furthermore, we can look for groups of objects known to be useful in introducing a certain topic in class (in German these are called “Lehrschriftenbezüge”). The system also takes information about the teacher searching for learning resources into account: whether he teaches in Lower Saxony, Berlin or Bavaria, whether she teaches in grade 6 or 10, in English, Geography or German, etc. Obviously, these possibilities can also be exploited by tailoring newsletters to the interests of the teacher, and to enable the subscription for new learning resources for the appropriate subjects and grades.

Cornelsen and the L3S will present these possibilities at CeBIT 2005, you are invited to take a look at the new possibilities the Semantic Web offers to customers of Cornelsen.
Grid Computing – Unprecedented Computing Power on Demand

MoRob in action

State-of-the-Art 3D Laser Scanning

The MoRob (Modular Educational Robotic Toolbox) project, a collaboration of the L3S with the KTH Stockholm and Stanford University, started in October 2002 and has been running over a period of two years. The overall goal of MoRob: Providing a framework for teaching and research with robotics, aimed at undergraduate and graduate students as well as PhD research.

Within this framework, we developed the Scalable Processing Box (SPB), a standardized processing unit for easy experimentation with any kind of robotic platform. The SPB hardware is complemented with the adaptive control architecture LiRE (Linux Real-time Environment), providing the base to run robot control software on a variety of platforms. Our MoRob Kits, developed in close collaboration with the Institute for Systems Engineering, Real Time Systems Group (RTS) at Hannover, are flexible and modular robotics kits for teaching and research. These kits, including two SPBs as processing platforms, are becoming the technical base in research and educational projects at our institute in Hannover.

Stability, versatility and robustness in mechanics and software ensure a flexible design for a wide range of different applications. For navigation, the kit is equipped with state-of-the-art sensors. It is an ideal base for Masters projects as well as PhD research. An example is the research in the area of 3D laser scanning at the RTS which benefits from the construction of the SPB and the MoRob kit. LiRE running on the SPBs is used as a flexible operating system in the development of a complex 3D laser sensor. The real-time processing and communication abilities enable powerful pre-processing and distribution of the acquired data of the laser scanner. Flexibility of the MoRob Kit allows students and researchers to investigate for example different mechanical setups in 3D laser scanning. Rotation of a 3D scanner to get 3D information proved to be the most excellent solution. A number of prototypes were built by students and evaluated in student project work. One of the projects was showcased at Hannover Industrial Fair (Hannover Messe) 2004.

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State-of-the-Art 3D Laser Scanning

The MoRob (Modular Educational Robotic Toolbox) project, a collaboration of the L3S with the KTH Stockholm and Stanford University, started in October 2002 and has been running over a period of two years. The overall goal of MoRob: Providing a framework for teaching and research with robotics, aimed at undergraduate and graduate students as well as PhD research.

Within this framework, we developed the Scalable Processing Box (SPB), a standardized processing unit for easy experimentation with any kind of robotic platform. The SPB hardware is complemented with the adaptive control architecture LiRE (Linux Real-time Environment), providing the base to run robot control software on a variety of platforms. Our MoRob Kits, developed in close collaboration with the Institute for Systems Engineering, Real Time Systems Group (RTS) at Hannover, are flexible and modular robotics kits for teaching and research. These kits, including two SPBs as processing platforms, are becoming the technical base in research and educational projects at our institute in Hannover.

Stability, versatility and robustness in mechanics and software ensure a flexible design for a wide range of different applications. For navigation, the kit is equipped with state-of-the-art sensors. It is an ideal base for Masters projects as well as PhD research. An example is the research in the area of 3D laser scanning at the RTS which benefits from the construction of the SPB and the MoRob kit. LiRE running on the SPBs is used as a flexible operating system in the development of a complex 3D laser sensor. The real-time processing and communication abilities enable powerful pre-processing and distribution of the acquired data of the laser scanner. Flexibility of the MoRob Kit allows students and researchers to investigate for example different mechanical setups in 3D laser scanning. Rotation of a 3D scanner to get 3D information proved to be the most excellent solution. A number of prototypes were built by students and evaluated in student project work. One of the projects was showcased at Hannover Industrial Fair (Hannover Messe) 2004.