European Union Research Programme

Technology-enhanced Learning

Research, activities and future directions

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Overview of presentation

- **Situating Technology-enhanced learning research**
- **Our focus – and its rationale**
- **What results and impacts**
- **Developing a strategy for the future**

Context

- **Multimedia technologies & Internet have been used to improve quality of learning, making it easier to access resources and services**
- **Yet … there have been as many disappointments as successes**

The match between the problems and the technological solutions often fails

Learning & technologies
Match and mismatch

- **Better learning technologies improve competitiveness, productivity and well-being**
- **Investment in human capital contributes significantly to economic performance**
  - Positive correlation between
    - years of schooling and earning;
    - input into human capital and output per worker;
    - economic performance and learning

Learning & technologies
Match and mismatch

- **Public and private organisations invest heavily in both formal and informal learning**
  - Improving workforce productivity is a driver for HR initiatives
  - Yet on average – people transfer less than 30% of what is learned in formal training to the professional workplace in a way that enhances performance
- **Despite success stories (IBM, Ernst & Young, Rockwell Collins, etc. - 2000), several companies have not seen economic advantage from the investment in the technological solutions**

Learning & technologies
Match and mismatch

- **Some reasons:**
  - Implementation and take up are far more difficult to realise than anticipated
  - Need to demonstrate convincingly the effectiveness of learning technologies
  - Investment / business benefits

Challenges

- **Better understanding of learner, learning context, social processes**
- **Support move to user-centred design processes**
- **Integrating learning and knowledge management with business planning – competence building**
- **Demonstrating that eLearning can deliver benefits in terms of learning effectiveness and efficiency`(do people learn better / faster?)**

Our research
From yesterday to today

- **Evolution of concept**
  - from generic to individualised solutions
  - more realistic assumptions about the systemic changes needed
  - Interdisciplinary research (cognition, pedagogy, social and organisational aspects, brain research, technology)

Focus for technology-enhanced learning research

- **Our research priorities 2002-2006**
  - Enhancing our capacity to reflect the complexity of learning - in complex and dynamic environments
  - Reinforce learning as a social process through new collaborative models
  - Customise learning to individual needs – at school, work, throughout life, ubiquitously
  - Build competence – linking organisations' objectives and learning goals of individuals
  - Support (new) pedagogical approaches that blend new and old ways of learning
  - Fostering a seamless integration of learning, knowledge and working spaces
  - Contributing to a better understanding of learning and cognitive processes

Focus for technology-enhanced learning research

- **Underpinning principles:**
- Purely technology-based approach is bound to fail - interdisciplinary research
- Advances in intelligent & cognitive systems and in neurosciences establish a new baseline for ICT for learning

Current project portfolio

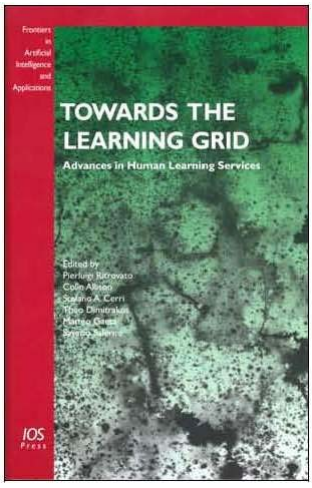
- **Research issues currently tackled**
  - personalisation and adaptive learning, dynamic mentoring (**LeActiveMath, iCLASS**)
  - services based on high performance distributed computing infrastructures, such as GRID for collaborative learning (**ELeGI**)
  - experience-based learning in the classroom, merging formal and informal learning (**iCLASS, CONNECT**)
  - innovative learning resources for professional training (**PROLEARN**)
  - promoting interoperability and standards for learning objects and systems (**TELCERT, UNFOLD**)
  - building a European Research Area in the field technology-enhanced learning (**KALEIDOSCOPE**)

FP6 Projects

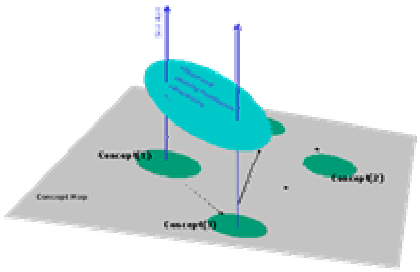
eLEGI

- New models for Ubiquitous and collaborative learning
- Advanced service-oriented GRID based software architecture for learning

http://www.elegi.org/



FP6 Projects



- Ubiquitous access for all stakeholders (parents, teachers, students, Ministries, publishers)
- Ontology-based architecture for sequencing individualized learning objects

http://www.iclass.info/iclass01.asp

FP6 Projects

kaleidoscope
concepts and methods for exploring the future of learning with digital technologies

- Network of Excellence: Integrates more than 75 research units from around Europe
- It is a community of more than 800 researchers in 23 countries
- Joined efforts to develop new concepts and methods for exploring the future of learning with digital technologies

http://www.noe-kaleidoscope.org/pub/

FP6 Projects

- **Network of Excellence in professional learning and training**
- **Research activities**
  - Personalized Adaptive Learning
  - Interactive Media
  - Online Experiments
  - Learning Objects, Metadata and Standards
  - Business Models, Processes and Markets
  - Knowledge Work Management

http://www.prolearn-project.org/

4th Call for Proposals

- **Reinforced by new research:**
  - learning & knowledge: work on interactions between learning of individual and the organisation – how ICT can mutually enhance learning processes for both;
  - learning & cognition: new understandings of learning processes – exploring links between human learning, cognition and technologies;

Call 4 analysis

Learning and knowledge

- Integration of KM and LMS strongly rooted in different organisational contexts /workplace
- Knowledge infrastructures for Communities of Practice (CoPs)
- Evolution of competences and complex problem solving - key elements

Learning and cognition

- Interdisciplinary nature of research, integrating pedagogy, cognitive science, neuroscience and computer science
- Wide range of technologies including game-based learning, mechatronics, visualisation and simulations.
- Focus on supporting and understanding the learner in different and complex social situations
- Involve strategies such as role play, affective engagement, and improving attention span.
- New pedagogical paradigms, conceptual models and innovative technology in different subject areas – music, mathematics, languages.

Combined elements of the learning and knowledge and learning and cognition: topics of discussion and collaboration, supporting cooperative team work processes.

24 Projects ~ 80MEUR funding

Coming soon

APOSDLE – Advanced Process-Oriented Self-Directed Learning Environment

- Increase knowledge worker productivity by supporting informal learning and teaching activities in the context of knowledge workers' everyday work processes.
- APOSDLE will result in a methodology and reference architecture for workplace learning that enhances the learning processes for both the individual and the organization.

Coming soon

ARGUNAUT – An Intelligent Guide to Support Productive Online Dialogue

- Facilitating the interaction in e-discussion environments: Tools to assist moderators/tutors in their role to enable effective discussions with an added value to the learning or working process.
- Technically, the project explores the use of graphical argumentation maps and artificial intelligence components, such as off-line analysis methods based on machine learning techniques.

Coming soon

AtGENTIVE – Attentive Agents for Collaborative Learners

- Artificial agents for the management of attention as one of the key factors of learning performance.
- The project aims to provide a conceptual model of attention in collaborative learning contexts that is rooted on the findings of cognitive science
- It will exploit embedded characters which are able to profile the learners' state of the attention by observing their actions, to analyze these states of attention, and to provide proactive coaching (assessment, guidance, stimulation, etc.).

Coming soon

eCIRCUS – Education through Characters with emotional-Intelligence and Role-playing Capabilities that Understand Social interaction

- The project focuses on efficiency of role-play, narrative engagement and empathy on cognitive and emotional learning processes in complex social situations.
- It will develop an interactive 3D environment populated by synthetic characters with autobiographical memory, individual personalities and improvisational capabilities.
- Validation for bullying and refugee integration in schools

Coming soon

i-Maestro – Interactive Multimedia Environment for Technology Enhanced Music Education and Creative Collaborative Composition and Performance

- Innovative IT solutions for music education by combining new pedagogical paradigms with cooperative and interactive self-learning environments and computer-assisted tuition in classrooms.
- It will develop a technology-enhanced environment for ear- and practical training, for training of creativity, analysis, cultural navigation, ensemble playing, and composition.

Coming soon

PALETTE – Pedagogically sustained Adaptive LEarning Through the exploitation of Tacit and Explicit knowledge

- It aims to increase the quality of learning tasks performed by learning communities of practice by exploiting diverse mental models, knowledge and competences of individual members, and by supporting social interaction, active participation and exchange of both codified and tacit specialist knowledge.
- It will develop information services, knowledge management services and mediation services for communities of practice of diverse contexts.

Coming soon

PROLIX – Process-oriented Learning and Information eXchange

- PROLIX overall objective is to align learning with business processes in order to enable organisations to faster improve the competencies of their employees according to continuous changes of work requirements.
- The solution to be developed integrates a number of technologies such as user modelling, models and workflows for competence building, simulations, and games into a reference architecture for process-oriented learning and information exchange.
- Test beds in a governmental social care institute, a telecom organisation and educational publishing houses.

Coming soon

TenCompetence – Building the European Network for Lifelong Competence Development

- TENCompetence aims at supporting individuals, groups and organisations in lifelong competence development.
- RTD activities intend to further develop and integrate models and tools for the creation, storage and exchange of knowledge resources, learning activities and units of learning, competence development programmes and network data for lifelong competence development.

Coming soon

AtGENTIVE – Attentive Agents for Collaborative Learners
COOPER – Collaborative Open Environment for Project-Centered Learning
L2C – Learning 2 collaborate
LEAD – Technology-enhanced Learning and Problem-solving Discussions: Networked Learning Environments in the Classroom
ReMath – Representing Mathematics with Digital Media
ELEKTRA – Enhanced Learning Experience and Knowledge Transfer
KP-LAB – Developing Knowledge Practices – Laboratory

Coming soon – SO 2.4.13 Enlarged Europe

CALIBRATE – Calibrating eLearning in Schools
ELU – Enhanced Learning Unlimited
eMAPPS.com – Motivating Active Participation of Primary Schoolchildren in Digital Online Technologies for Creative Opportunities through Multimedia
iCamp – Innovative, Inclusive, Interactive & Intercultural Learning Campus
L2C – Learning 2 collaborate
LOGOS – Knowledge-on-Demand for Ubiquitous Learning
LT4eL – Language Technology for eLearning
mGBL – Mobile Game Based Learning
UNITE – Unified eLearning environment for the school
VEMUS – Virtual European Music School
ARISE – Augmented Reality in School Environments

What about content?

- **Objectives of eContentplus programme**
  - increase searchability, reusability, repurposing of content
  - support creation of interoperable pan-European services, i. a. brokerage of learning objects
- **Digital learning resources seen as condition for market development, but no longer as research challenge**
- **Synergies between work in digital libraries and learning repositories**

Where do we see potential impacts?

- **Workplace – extended learning, through life, in extended organisations**
  - improve return on investment on integrated solutions for learning
  - shorter time periods for learning, speeding up time to competencies (goal of 56% of organisations)
  - greater efficiency in business processes – speed up and cut costs of on-the-job learning, ease change processes in organisations
  - enable capitalisation of organisational intellectual assets

Where do we see potential impacts?

- **Improve effective use of ICT-based learning**
  - research into better conceptual models of technology enhanced learning
  - greater capacity to deliver individualised or personalised learning
- **Support HE sector in move towards lifelong learning**
  - coping with increasing diversity in the student population and their modes of attendance
  - continuous professional development
  - competition on a global scale
- **Contribute to competitiveness of eLearning suppliers**

Creating the baselines for future research

- **New collaborative learning environments – more and better collaboration of teachers and learners**
- **New pedagogical models for constructivist learning; integration of experience-based learning into formal learning**

Creating the baselines for future research

- **New knowledge on the interplay between human learning and intelligent systems – extending multidisciplinarity**
  - transition from mentoring systems towards intelligent, dynamic, adaptive tutoring systems
- **New models of individual and organisational learning**
  - personalisation & customisation; integration of LMS & KMS
- **Boost the interoperability of learning resources**
  - including pedagogical information into structure of learning resources, tools for content producers to verify interoperability level

Conclusions

- **Increased focus in FP6**
  - Investment into research aiming at new knowledge and real impact
  - Centred around the learner and (ICT-enabled) learning process
- **Focus does not mean narrow – underpinned by increase in cross-disciplinary research**
- **WP2005-06 helped identify core challenges**
  - Learning in humans and machines
  - Continue consolidation of KM and learning technologies
- **Working for the research agenda for FP7**

Further References

European Commission
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- **Website:**

http://www.cordis.lu/ist/directorate_e/telearn-digicult/index.htm

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