

Social, affective and normative aspects of learning in ICT-enriched Learning Environments – Collaborative exploration of societal aspects of ICT

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Abstract

E-learning and learning in ICT integrated learning environments will be a most important part of future learning scenarios, especially in the fields of 'Media Education' and 'ICT in Education'. ICT integrated learning scenarios often only address the cognitive level of learning and teaching processes. But to learn successfully about problems of digital divide, cyber risks, data privacy and the impact of ICT on a changing society there is not only a need of the acquisition of knowledge. It is also necessary to change attitudes, to reflect on normative orientations in a society, to develop criteria for the evaluation of ICT related action scenarios and to enable people to gain guidelines for their own behaviour in ICT evoked conflicts and dilemmas. Therefore the paper describes different types of ICT integrated learning scenarios such as computer supported simulations, role games and strategy games which we tested with students in the department of computer science at the University of Paderborn. The common concept of these learning scenarios is to provide the learners not only with knowledge within the area of ICT but also to create scenarios of individual concernment and consternation. Learners will face conflicts and tasks which not only challenge their cognitive abilities but also confronts them with their own attitudes and feelings towards ICT evoked dilemmas.

Learning in ICT-enriched learning environments

Learning in computer enriched learning environments is not only a matter of individual appropriation of knowledge in a human-computer interaction scenario where one individual uses one computer. More traditional concepts of learning like CBT or WBT in the tradition of behavioural learning theory may be successful in supporting learners to acquire skills like typing or formal types of knowledge like learning vocabulary. More complex problems and learning tasks demand sophisticated learning strategies and learning environments which includes the chance of communication and interaction between students in computer enriched learning environments.

Complex problem tasks need a division of labour within learning communities enabling collaboration to work and learn effectively in a team. It is not only necessary to retrieve, analyse and synthesise information and use it for the common process of problem-solving but also to learn about critical thinking and the evaluation of complex problem-ridden situations. The implementation of team work in learning situations enhances the dimensions of learning from 'know what' to 'know how', 'know why', 'care why' and finally to 'feel like'.

Learning theories of Vygotski, Leontjew and Aebli emphasise the social nature of learning and the necessity to link it to communities of practice (Wenger). According to these theories, it is crucial to offer students the opportunity to take roles in different action scenarios, learn about different views and interests on a topic and to negotiate about problem-solving strategies. This concept of learning does not only aim at the cognitive level of learning but also pays attention to affective and normative aspects of learning and problem-solving abilities of human beings.

It is the demand of a learning community which partly uses network facilities that after sequences of face to face learning situations in teams with direct human communication and interaction, the technical platform should support the team's efforts to communicate and collaborate via the web or a local area network. Not only databases or web resources for knowledge management purposes should be available but also computer based multi-user action scenarios for the members of a learning-group.

According to Jonassen (1995), technical platforms may support learning communities in different ways: 'active', 'constructive', 'collaborative', 'intentional', 'conversational', 'reflective' and 'contextualized'. Therefore, technical platforms for CSCL have to support different types of synchronous and asynchronous communication between members of a learning-group. They should provide the learning community with platform functions like email, newsgroups, chat, shared data bases, concepts of group awareness, scheduling and mind mapping tools, shared whiteboards, document processing software and multi-user simulation and exploration environments.

Learning about societal aspects of socio-technical information systems

The assumptions of a learning-concept in ICT enriched learning environments are independent from the related topic. Especially in the fields of learning about ICT, where questions on designing a computer based information system and the social impact of system design have to be discussed, these concepts of learning are very important.

The development of a computer based socio-technical information system needs to anticipate future action scenarios of people who will work and learn together by using the future system. Therefore, system design is a highly communicative process in which future social interaction between people and human computer interaction patterns will be modelled. In the department of computer science at the university of Paderborn we want students (future teachers in informatics or media

education, future computer scientists) to gain experience in the scope of system design and the social impact of ICT. In regard to a more complex theory of learning we confront them with design conflicts, conflicting interests between customers, developers and users of ICT and problem related action scenarios to foster their problem-solving abilities within the field of system design and teaching informatics. To realize these enhanced learning processes, we organize action scenarios where students in a team directly experience the requirements of system development, e.g. by video based 'real world use cases' or in role plays where they have to take the roles of customers, developers and users of the system.

New role of teachers in learning communities

In these kinds of action scenarios we have to realize a change from teaching to learning combined with changing roles of teachers and students. Students assume a more responsible part within the process of knowledge acquirement and improvement of their skills towards self-directed learning. Teachers more and more switch into the role of moderators and managers of learning processes who have to take care of learning materials, resources and technical facilities of a learner centred environment. In this type of action related scenarios it is not only a task for students to acquire knowledge but also to evaluate problem-ridden situations, to get an idea of feelings that persons own, who are affected from the social impact of ICT. Thus, students will gain affective and normative experience and evaluation competencies towards socio-technical information systems influencing their attitudes and future behaviour. As an aftermath of such learning concepts they will get an idea of the fact that computer based technical system design is not only driven by technical needs and purposes but also by interests of pressure groups and business matters.

ICT related action scenarios for social and affective learning

In the following parts of the paper some collaborative concepts of learning and action scenarios will be presented that should meet the challenge on more complex types of learning for learning communities in ICT related action scenarios. Some of the scenarios are related to ICT as a topic and don't need any computerized support. Others use net based learning environments with groupware functionality. The presented concepts are suitable for higher education as well as for secondary level. Only complexity of content and objectives must be adapted according to the competencies of the members of the learning-group.

Object games and video supported analysis of system requirements

During a phase of object oriented modelling in a system development process it is necessary to find classes and tasks of objects and their methods. Students are supposed to find class candidates in a simple role game. In this 'object game' students play the roles of future system objects by taking on the responsibilities and the collaboration with other objects. In this way they will be able to test different use cases in the field of system requirements and learn about objects, their methods and their interaction within the information system. Similar to this approach of action oriented learning is the CRC-concept of Ambler, where classes, their responsibilities and collaborators will be written on cards by the participants of the game. Use cases will be tested by students by monitoring the class card they own, supplementing and adapting the existing class methods according to the actual demand of action. Thus, the students will enhance their concept of software engineering and design within the area of system application. They will get a first idea of the class structure which later on can be transmitted to a UML compatible CASE-tool (e.g. togetherj) and there should be refined for implementation. To gain a better understanding of the system's needs and demanded functions it is useful to analyse videotaped interviews of users and customers describing different use cases. With this concept of video supported analysis of system requirements students should be able to identify with different roles, interests and views on a computer based information system and gain evaluation competency for real word ICT-systems.

Strategy games and role plays to learn about cyber risks

In a strategy game called *DataTraces* related to the topic of data privacy, students should learn a lot about cyber risks in an information society without using a computer. The order of events in the game is split into three phases and the students take over different roles in each part of the game. In the first section of the game every student has to follow a role with several tasks as to go to the supermarket to buy some food, to go to a discotheque to have some drinks there, to go to a library to lend some books or to buy some clothes in a boutique. Some of the actions are obligatory, some are not. Nobody knows the tasks of other people, and the students have the choice which goods or books they will purchase. The action scenario is based on the assumption that money in an information society is not available any more. Every commercial transaction will be realised by using a point of sale concept, where people have to hand out their credit cards which contain their personal identity number. The number will be entered to an electronic account and be transmitted to a bank, where the customers current account balance is stored. This number is a definite key to all databases and it is used to link the different personal data in all the existing databases. Within the first part of the game, students will leave a lot of data-traces.

In the second section of the game, the players will be given some information about events that happened. Walls have been soiled with graffiti during the night, a hit and run accident happened, a company is looking for a new employee in a leading position and the team is facing the demands on recruitment consultants; an advertising company is starting a campaign to find new subscribers for a newspaper, etc... Teams of investigation will be formed and they will be engaged to analyse the available data and look for suspects and chosen ones. Admission to all databases is free and the personal data of every person can be arranged to examine if they match with the profile of the wanted person. During this process of investigation students learn that they are very eager to collect data in order to do their job successfully and they won't care very much about data privacy.

In the third section students learn about feelings being accused of having committed a crime although they are innocent. They will learn what it means to be a transparent personality. They will be either accused or invited to further investigational talks. Now they are in a complete different role and they learn about the necessity to tie data collections closely to the purposes of its evaluation. Also, they learn about concepts of criminal search, data exchange, the meaning of a nationwide primary key in databases and the consequences of unlimited account to personal data. The results of that game including emotions, affective and normative aspects into a ICT related learning process are very encouraging in terms of establishing students evaluation competencies towards applications of ICT.

Computer supported net based simulations to learn about digital divide

In a net based game called *Crossroads*, teams of students are the owners of a truckage company. They own different types of trucks, like a refrigerated truck, a heavy load truck or a furniture van. Via a simulated satellite observation system they will receive information about the trucks' actual positions on the highways which are visualized on a map on the screen. They get information about new assignments, which will be created by a random generator. Assignments which cannot be executed will be transmitted into a common information pool, where other companies may accept the job. Companies who receive assignments from the pool have to pay these companies which gave the information about the job into the information pool. The teams have to optimise the routes of the trucks by planning to transport as many goods as possible up to the transportation capacity of the trucks and they have to avoid deadheads as far as possible. The aim of the game is to maximise the company's profit. Moderators of the game may influence the action by excluding some companies from the information about new assignment or reduce the number of new jobs. Thus, students learn that in an information society information is a worthwhile good and a factor of political power. Exclusion from information could lead to an economic disaster or to a loss of political influence. So they learn in a cognitive and affective way that types of digital divide not only occur between industrial and developing countries but also within a developed information society.

Computer based strategy-games to learn about the social impact of ICT

The net based strategy-game platform *Balance* can be connected to different databases with topic related documents. It provides the teams playing in the game not only with the game's rules and the guidelines for the group's intentions and actions but also with relevant documents. Some of the documents (text, graphic, animation, video) are available for all groups, some are specific for a group and cannot be accessed by others. The platform is also used as a communication facility between the groups to create and exchange documents, negotiate on agreements and common strategies or to schedule dates for face to face meetings. Phases of net based communication between the teams are alternating with attendance periods. When the game is over, communication structures between the groups may be categorised and analysed by using the systems records for the needs of evaluation. Different action scenarios are conceivable. At the University of Paderborn we are experienced with ICT related scenarios dealing with conflicts between new economy and ecological requirements. The acting teams are: the management of an ICT-company, unions, different political parties oriented to the programs of real ones and the editorial staff of a newspaper. Participants in the game will learn about the contradictions between technical and ecological development and about possible solutions not only on a cognitive but also on an affective and normative level.

Net based decision- making systems

Decide is a net based decision-making platform which can be used to support the process of decision-making within a group. All participants communicate via net with a pseudonym so that these personal relationships between group members cannot be used as guidelines for decision-making and voting. Topic related proposals will be entered into the system by the participants via keyboard and through a local network. The teachers can moderate the process of decision-making by sorting and summarizing the proposals on a shared net based whiteboard. The functions of the platform are very similar to those of a chat room. Most of the net based discussions are very topic-centred, and participants declare that after having used the platform they became aware of the influencing factors like friendship and opinion leadership they usually obey when making their decisions.

Meeting communities of practice

Other action oriented scenarios in ICT learning environments aim at a strong connection between learning communities and communities of practice. In a project called *LocalNet* students establish a web based community network in their local community and provide it with information on a homepage and with interactive content like news groups and panels for voting. Students work in the editorial board of the community network, acquiring and presenting information on real world problems. They gain experience in web design, administrating a web server and in using multi-media publishing tools. Furthermore they learn a lot about difficulties of being an independent observer of the local cultural and political scene and about the influence of commercial and political pressure groups on publishers.

Conclusions

One important conclusion of the paper is the demand on curriculum developers to integrate these types of enhanced learning scenarios with cognition enriched and non-cognitive impulses in ICT related curricula in secondary and higher education. Another conclusion is that teachers have to cope with societal and ethical issues relating to ICT and they have to change their roles in teaching processes towards managing students' self-directed learning

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