Oliver Hankel, Iver Jackewitz, Bernd Pape, Monique Strauss

Technical and Didactical Scenarios of Student-centered Teaching and Learning

Abstract / Zusammenfassung

In this paper we envision didactical concepts for university education based on self-responsible and project-based learning and outline principles of adequate technical support. We use the scenario technique describing how a fictive student named Anna organizes her studies of informatics at a fictive university from the first days of her studies to making a career for herself.

In diesem Artikel entwickeln wir didaktische Konzepte für die universitäre Lehre, die sich an selbstverantwortlichem, projektbasierten Lernen orientieren. Hierfür entwerfen wir Leitlinien einer angemessenen Softwareunterstützung. Wir verdeutlichen unser Konzept anhand von Szenarien, die eine fiktive Studentin namens Anna durch ihr Informatikstudium an einer erfundenen Hochschule begleiten.

1   Introduction

Many ICT-based learning environments provide teachers with powerful authoring tools and content management tools to design online-learning-courses. While these tools might seem to be a great help to perform higher education, they bear the danger of being didactically set on traditional, unilateral scenarios putting students in a passive position as recipients of fixed-up content. Following recent didactical and learning theories we emphasize students taking up responsibility for and an active role in their own learning process and collaborating with each other and with their teachers to build up new or acquire existing knowledge.

In our work, we have been developing didactical scenarios based on self-responsible and project-based learning and technical support to clarify our perceptions of good, software supported university education. In this paper we accompany the fictive student Anna in four scenarios through her studies at the Department for Informatics of a fictive university. As software support we describe the community system *CommSy* (http://www.commsy.de), which was designed according to the didactical principles outlined above.

2 CommSy as software support for student-centered teaching and learning

CommSy is a web-based system to support communication and coordination in learning communities, e.g. university departments. A survey of the main components and functionality is given in Scenario No. 1 (*Anna`s first days of her studies*). The following design principles distinguish *CommSy* from other software products (Jackewitz et al. 2002, Pape et al. 2002):

Easy to use: Enabling individuals to easily use *CommSy* is a prerequisite for use in a learning context where it is not arguable to have long-term adjustment and training. The learning activities and not technical barriers should be at the center of attention. Therefore *CommSy* offers only required functionality and a simple, recurring structure across the whole system.

Responsibility in cooperative usage: CommSy gives special emphasis to user communities rather than individuals: Portal as well as Project Rooms can be customized group wise rather than individually in order to establish a group identity. *CommSy* supports only a very limited concept of roles: all members of a *CommSy* – students as well as teachers – may use the whole set of functions and are granted access to all contents of the system. That reflects social manners we promote in our daily interaction with our students, like self-responsibility and commitment, in the system.

Embedding in a media-mix: In our point of view it is not desirable to design an all-embracing tool to cover every possible communicational need. In our experience additional media such as Email, standard office software and of course telephone and personal contact will be used by actors anyway and do not necessarily have to be implemented in a system for community support such as *CommSy*. Also we regard the ability to make an appropriate choice of media for the respective purpose and goals as an important component of media literacy.

3 Using scenarios for envisioning and discussing the didactical use of software

According to current theories computer supported learning processes are highly individual and do not follow a standard pattern (cf. Jonassen/Mandl 1990). At the same time it has to be acknowledged that these highly individual learning process are influenced by various factors in a computer supported learning environment, e.g. the respective software system, computer accessibility, and by multiple actors involved pursuing different

objectives and roles, e.g. learners, faculty, technical staff, societal actors. Due to this manifold setting it seems to be necessary to undertake an integrated organisational and software development for the didactical use of software support (cf. Fullan 1999, Kubicek/Breiter 1998).

In order to deal with this high complexity, we need an understanding of software use which acknowledges that software systems unavoidably restructure human activity, creating new possibilities as well as new difficulties, and which examines the social choices of whether and how to computerize an activity, and the relationships between computerized activity and other parts of our social worlds (cf. Kling 1996; Carroll 1999).

The use of scenarios offers a possibility to anticipate and envision the typical and significant user activity in a qualitative manner and to discuss the results with different actors (Klein/Rohde 1994, Carroll 1999). Scenarios are made up of the following elements (cf. Carroll/Rosson; Carroll 1999):

- a *setting* – scenarios describe a starting scene for the described episode;
- *actors* – as typical for human activities scenarios include many actors;
- *goals* and *objectives* – actors typically pursue different goals or objectives;
- *actions* and *events* – scenarios have a plot, they include a sequence of actions and events;
- *claims* – the authors should reveal the underlying claims – the wherefores and whys – of the scenario.

Scenarios are considered helpful when use experiences with new technologies lack or when the use depends on dynamic and diverse social process that prohibit to completely assess the respective requirements and claims. And they are used as elements of the life cycle in the development of systems for computer-supported cooperative work and in approaches for participatory software design.

In the following paragraphs we use the scenario technique to develop our understanding of software support for student-centered teaching and learning in university education. A section pointing out the inherent didactical and technical claims and also possible stumbling blocks that might be encountered by the actors involved follows each scenario.

4. Didactical and technical scenarios of student-centered teaching and learning

4.1 Anna`s first days of her studies

Anna is a freshman at the Department for Informatics and has just got through her starting week. She learned that her department is supported by

the community system *CommSy* that is used by students and teachers. Together with other freshmen she has just registered for the system. "Have a look at it if you get the chance", one of her tutors said. "You`ll find some information about your courses there as well."

In a quiet moment Anna seizes a computer, opens a browser and finds the homepage of the department's *CommSy* Portal named "informaticSy". While browsing through the site she quickly notices that some lecturers have actually placed extensive material for their courses here. Most of them have also opened a so-called "project room" for their course. What that might be? Anna quickly finds out that she only may enter a project room if she's a member of that course. Then she notices that students, for example to form study groups, also opened some project rooms. Is everyone allowed to do that? Anna tries to click on the "New" button. Cool – Anna might actually open a new project room right away. Then she takes a look at the other rubrics on the portal. The different institutes of her department are listed here, with a short description of research activities and links to the courses they offer. Lecturers describe their teaching and research interests on the portal. Anna recognizes some of the major fields of study that were presented to her by her tutors. Besides, there are links to other universities and research institutes, addresses of companies and professional organisations and so on. Anna enters her own contact information, complete with a picture of herself.

Then Anna turns to the archive part of *CommSy*. Faculty members have stored bibliography and lecture notes here. But there are also reports, presentations, thesis papers and project results that were posted by students. Finally, Anna decides to take part in a project concerning "CSCL" (Computer supported cooperative learning) this semester. The course will also use *CommSy* as software support. Then she will eventually get to see one of these mysterious project rooms…

Claims inherent in this scenario

This scenario aims to give an overview over the software system *CommSy*. A learning community using *CommSy* can set up their own *CommSy Portal* to offer information and guidance on courses, sub departments, faculty staff and research activities. An *Archive* is available to store and publish lecture material as well as students` work such as project results or thesis papers. Selected contents can be made accessible web-wide. At the heart of *CommSy* are the so-called *Project Rooms* that can be used by smaller groups of 10-30 persons engaged in a particular learning activity such as a university course.

By their functional scope, project rooms support central activities of a learning project as outlined by Gudjons (1997). Communicational means

such as discussions and the announcement of news and events are available. Working material can be collected in a simple reference manager and put in context by linking them to any other item. Also, documents can be written cooperatively using the provided group-editor.

Using *CommSy* as software support can thus promote Community building and identity within a learning community and serve as its public visiting card.

Possible stumbling blocks

A poorly used and maintained *CommSy* will constitute a poor visiting card for its institution. Time and personnel will be needed to ensure availability, up-to-datedness and quality of the system's contents. Also, the community needs to ensure that all of its members have adequate access to the system and that nobody is severely disadvantaged by the use of the software.

4.2 Anna does project work

In the first meeting of the CSCL course Anna finds out that they will work independently, preferably in small groups, throughout most of the semester and will have in-between plenary sessions to report on their work and get feedback. The first two sessions will be dedicated to finding an appropriate research topic for the semester and people to work with on this topic. The organizers of the course will also give an introduction to the field of CSCL. To coordinate the project work and to facilitate communication between plenary sessions they set up a *CommSy* project room and copied some initial materials and bibliographic sources from the *CommSy* archive to help the students get started.

Anna also searches the archive on her own to get some ideas for her project work. She browses through the project reports that were posted by students who attended last semesters` CSCL course. Owing to the freedom the students experience in their work these reports are all very different: some groups did extensive literature work, others focus more on the research process. There is also a broad range of topics that were chosen. However, she misses in all those reports a description of how the teams organized their work and made it successful. Anna herself has made some negative experiences with teamwork. (…)

An exciting semester lies behind Anna. In spite of some minor problems and quarrels it was fun to work on a self-chosen topic together with others. Altogether, they reached some interesting results. Anna has just made the last minor changes in their project report which they wrote cooperatively using the group editor in their project room. Anna adds the final project report to the *CommSy* archive. A description of their teamwork has been

added, too: Anna pushed her team to write an "Instruction for productive teamwork". Anna hopes that one day she will get feedback from her fellow students.

Claims inherent in this scenario

In our teaching we put an emphasis on project-oriented work (Gudjons 1997) leaving room for students to develop and express their own learning interests and ideas. Therefore acquiring of knowledge is seen as an active endeavor in which social and group experiences play a major role. Project work puts an emphasis on hands-on, practical experience. Students take on responsibility for planning and implementing their project work. Doing this in teams together with others can help overcome initial problems in the process of self-organization and promotes the crossing of perspectives and adopting of new viewpoints, especially when students from different faculties are involved.

Teachers in this setting act as *facilitators* (Rogers 1969) encouraging individual and group learning processes rather than "classical" lecturers.

Software support in this scenario aims at facilitating cooperation, communication and feedback processes between working teams and teachers. Also the software system serves as a publishing medium for students to present their work to a broader community.

Possible stumbling blocks

The mere existence of a software system does not automatically lead to a satisfactory use. The system should be embedded into courses in a didactically sensible way. Usage is encouraged if students experience a clear benefit from it. On the other hand, there might simply not be the need for close cooperation and communication in a virtual setting if the participants meet face-to-face on an everyday basis.

Also teachers will need to continuously moderate the use of the software system and actively use the system themselves.

4.3   Anna`s diploma thesis – her first publication

During her studies Anna focused mainly on Social Informatics. To gain her degree, she has to write her thesis. There was a course last term entitled "Writing your thesis: Doing it right". Anna finds some quite interesting materials in the *CommSy* Archive. For some time she has been interested in user support services and technology-use mediation, especially "online moderation". Anna browses through the *CommSy* Portal and finds several courses and some materials related to „user support". She also searches for

"online moderation" - the result page is blank. *No results? I think there has to be done something about that!*

Prof. Ahnung was the organizer of the two courses concerning „user support". Anna finds some information about Prof. Ahnung on his personal page: Among other things his email address and a list of possible topics for diploma theses. "Online moderation" is not on this list, but there are some comparable ones. Anna writes an email to Prof. Ahnung and he invites her to visit his consultation-hour. Prof. Ahnung is quite interested in Annas ideas about online moderation agrees to supervise her thesis. (...)

Nearly 6 months later Anna hands over three copies of her diploma thesis to the administration of her department. Prof. Ahnung told her to publish her thesis in the *CommSy* Archive, too.

Claims inherent in this scenario

This scenario describes the interaction of one person with a community of practice. Anna makes use of the knowledge of her community and helps to develop it further. Her studies do not take place in a vacuum. The community is alive and has a history and tradition of shared knowledge. This scenario implies a specific image of a scientific community: All participants are seen as equal contributors, they all have the same responsibilities and rights. Students as authors of scientific publications add to the knowledge of the community.

Media support in this scenario is multifarious. Anna searches for literature in the library, in the *CommSy* Archive and in the internet. She communicates via email and in face-to-face meetings. The actors chose from a variety of media the appropriate one for their respective needs. *CommSy* is only one component of this media mix and it does not serve every possible purpose. For example, Anna does not use *CommSy* as an authoring tool to write her thesis, but she uses it to publish her work for the scientific community.

Possible stumbling blocks

The culture of equal opportunities in the community is a challenge to all actors involved. *CommSy* makes nearly no restrictions to users. So the responsibility for a sensible use is handed to the users. If they fail to do so it might result in chaos or the system won't be used. In an ideal setting every participant of the community would act responsibly. With a capable facilitation and responsibilities and rights anchored in the organization of the community this might become a realistic goal.

4.4 Anna has made a career for herself

After finishing her studies ten years ago, Anna has been working for several management consultancies. Her current job is to consult firms at implementing knowledge management systems. Her job is very interesting because she has to mediate change processes together with different kinds of stakeholders. But she has to admit that she is working long hours in order to keep up with the latest technological developments and to take care of related controversial social issues. Altogether her job is a large burden for her private life. She puts up the question to herself how to strike a balance between her know-how, her career, and her private affairs. But what would be a good starting point for her personal change process?

Back in her office the next day, Anna remembers a seminar back in university dealing with working conditions in the IT-industry that covered some issues of her reflections the day before. She opens up her browser window and quickly finds the homepage of her former department. And yes, there is still this cooperative learning platform *CommSy*. Oh – while browsing through it she finds some interesting information on the topic of life long learning. There seems to be an interesting research project dealing with that. She gets stuck reading a recent paper by her former Professor, Mr. Ahnung. She immediately starts to write an email.

While further browsing around, she also finds a Project room facilitated by the Alumni-club of her former department. It serves as a discussion forum to exchange working experiences after leaving university. Plus, there is a forum with postings for job offerings … both forums seem tempting to Anna right now … so she clicks on the button that says "Apply for membership" and gets a message that promises a conformation for her application in a couple of days.

A few moments later her email-tool pings. There is a reply from Prof. Ahnung. He writes that he is pleased to hear that Anna has obviously made a good career for herself, and that it would be a pleasure for him to present his new research at her company. He is always looking for practitioners as possible cooperation partners. Further he describes a seminar on the work of knowledge engineers that he is currently teaching. He asks Anna if she could talk to his students about her professional experiences. Anna immediately clicks on the Reply-Button: "Yes, I would love to talk to your seminar participants, …"

Claims inherent in this scenario

Our understanding of university education does not stop with the graduation of our students. The scenario opens up two views on integrating university education and further education:

On the one hand, we work on approaches to integrate the work life experience of former students. These experiences help current students imagine a setting in which their learning objectives might be helpful.

On the other hand, we envision settings in which former students can take advantage of taking part in current teaching events. First of all, they can be offered opportunities to reflect on their daily affairs and pick up inspirations from new research results. Plus, they can profit from social networking with former fellow students, with former teachers and also with current students.

CommSy as software support in this scenario aims at bridging the gap between the individual organization of one's own learning process and the organization of learning processes as community experience at the same time. *CommSy* helps multiple actors from different institutions to exchange their experiences and thus to build up knowledge. Former students probably do not use *CommSy* on a regular basis. Therefore it is important that they can access the system via the Internet.

Possible stumbling blocks

Both our didactical and our software approach underlie restricting conditions:

Time-Space-Coordination: It seems questionable whether the involved actors take the necessary time to get in touch. The IT support might make getting in touch easier, but to be fruitful it still remains time consuming. Therefore, we presume that this interaction will not take place on a regular basis, but on specific occasions.

Necessity for Long-term Trust: Getting in touch on an intermittent basis requires long-term trust. The actors involved need a mutual understanding what to expect after extended periods of time without any contact. This necessity includes mutual understanding of personal preferences and likings as well as trust in the long time provision of institutional resources like *CommSy* and the content in the system.

5. Conclusion and further prospects

In this paper we used the scenario technique to illustrate our concepts of the didactically well-founded use of a community system in university education. Scenarios can serve as a means of facilitating communication between software developers and future users – in our case teachers and students. By depicting possible stumbling blocks in each scenario we pointed out that benefits will not appear automatically and rely on prerequisites that need to be taken into account. To anticipate possible

drawbacks we find it helpful to work out *best case* and *worst case* scenarios that can be discussed with potential users.

In our experience, scenarios are not only useful for software development processes. We also apply the scenario technique as a means of evaluating our didactical concepts (e.g. for target/actual comparisons) and to illustrate, envision and develop measures of organizational development. Furthermore, we currently investigate the use of scenarios for our user documentation.

References

Caroll, J. M. & Rosson, M. B. (1992). Getting Around the Task-Artifact Cycle: How to Make Claims and Design by Scenario. In: ACM Transactions on Information Systems, Vol. 10, No. 2, 181 – 212.

Carroll, J. M. (1999). Five Reasons for Scenario-Based Design. In: Proceedings of the 32nd Hawaii International Conference on System Sciences.

Fullan, M. (1999) Die Schule als lernendes Unternehmen, Stuttgart.

Gudjons, H. (1997). Didaktik zum Anfassen: Lehrer/in-Persönlichkeit und lebendiger Unterricht, Bad Heilbrunn.

Jackewitz, I., Janneck, M. & Pape, B. (2002). Vernetzte Projektarbeit mit CommSy. In: M. Herczeg, W. Prinz & H. Oberquelle (Hrsg.). Mensch & Computer 2002: Vom interaktiven Werkzeug zu kooperativen Arbeits- und Lernwelten, Stuttgart, 35-44.

Jonassen, D. H. & Mandl, H. (Eds.) (1990). Designing Hypermedia for Learning, Berlin.

Klein, L. & Rohde, M. (1994): Der Szenariobogen – Herleitung und Evaluation software-ergonomischer Gestaltungsanforderungen. In: A. Hartmann, Th. Herrmann, M. Rohde & V. Wulf (Hrsg.). Menschengerechte Groupware – Software-ergonomische Gestaltung und partizipative Umsetzung, Stuttgart, 173 – 193.

Kling, R. (1996). Computerization and Controversy – Value Conflicts and Social Choices, San Diego, 2. Aufl.

Kubicek, H. & Breiter, A. (1998). Schule am Netz - und dann? Informationstechnik-Management als kritischer Erfolgsfaktor für den Multimediaeinsatz in Schulen. In: H. Kubicek et al. (Eds.): Lernort Multimedia. Jahrbuch Telekommunikation und Gesellschaft 1998, 120-129.

Pape, B., Bleek, W.-G., Jackewitz, I. & Janneck, M. (2002). Software requirements for project-based learning – CommSy as an exemplary solution. In: Proceedings of the 35th Hawaii International Conference on System Science.

Rogers, Carl (1974). Lernen in Freiheit – Zur Bildungsreform in Schule und Universität. München: Kösel.