PERSONAL LEARNING ENVIRONMENTS FOR SELF-DETERMINED, ACTIVE AND SOCIAL LEARNING

Peter Hubwieser, Jan Böttcher
Technische Universität München, TUM School of Education (GERMANY)

Abstract

In our opinion, the typical learning scenario in European schools will change dramatically during the next decade, enforced by the increasing diversity of students, in compliance with the modern understanding of human learning as situated, socially embedded, active construction of knowledge, motivated by autonomy, awareness of competence and social relatedness. Today, it seems obvious that efficient learning cannot be restricted to closed classrooms and by fixed time-tables. Instead, the learning process will be promoted by comprehensive, contextualized tasks that are individually tailored to the students’ individual abilities and prerequisite knowledge. The students will process these tasks in close collaboration with peers. To support this collaboration and to ease the increasing workload of teachers, the learning process has to be supported by suitable Personal Learning Environments (PLEs). We suggest developing these PLEs based on a common requirement analysis and design outline. For this purpose, we had to define the presumed learning scenario, which will represent the application context of the system. In order to ease the communication with the future users, we are constructing the prototype MyLearnSpace. It is intended to support these learning scenarios by managing input information, learning tasks, individual progress of students and the collaboration with peers. For the requirements analysis, we conducted several interviews with expert teachers. These steps resulted in a first design outline that will be described in this paper.

Keywords: Learning scenario, personal learning environment, social networks.

1 INTRODUCTION

The diversity among school students is increasing more and more, caused for example by the inclusion of disabled learners or by increasing migration rates. This will enforce consequent differentiation of learning objectives, materials, methods and contexts. Additionally, the total knowledge of mankind, the complexity of modern societies and the demands on career-starters are steadily increasing, while the schooling time does not. This requires schools to work more and more efficient. One of the key factors for the efficiency of learning is motivation [1], [2]. According to current motivation theories (see Deci and Ryan [3]) proper motivation requires sufficient levels of autonomy, awareness of competence, and social relatedness. Furthermore, current learning theories, based on constructivism and brain-research, postulate problem orientation and activation of learners (see section 2). In regard of these trends, schools will have to change the organizational structure of learning processes towards more self-determination and more activeness of the learners.

In accordance with the OECD [4], we suppose that progressive learning scenarios will not become prevalent without strong support by specific software systems. One reason for this assumption is the increase in the workload of teachers caused by such scenarios. Another is the need for peer discussion and feedback as postulated by modern pedagogic approaches (see section 2). Additionally, the state of the art of modern Information and Communication Technologies (ICT) will provide strong technical support for such scenarios. Nearly every student has permanent access to a very powerful computing, information and communication device in form of his/her smartphone. Social networks are connecting millions of people all over the world. The increasing number of Massive Open Online Courses (MOOCs) is offering more and more information and tasks, developed by well-known researchers. Finally, Cloud Computing allows exchanging data easily between electronic devices all over the world.

Originally, our work on this project had aimed to design a social network for learning (see [5]), focusing on the aspect of social relatedness according to [3]. The underlying idea was that communities of learners should gather around “main topics” of school curricula (see section 7), helping the students to find peers with the same learning problems. Yet, during the requirements analysis we realized that this would fall short. Thus, we decided to “think big” and develop of MyLearnSpace as a prototypical integrated support system for a holistic vision of future learning in schools. The main goal of this work is to explore the requirements on such universal Personal Learning Environments (PLEs) by having students and teachers work with our prototypes and evaluating their feedback. For this purpose, we developed a vision of a future learning scenario based on current learning theories. Based on this scenario, we have performed a requirement analysis for a universal PLE and developed prototypes for several components. This article presents the first outcomes regarding the intended learning scenario, some important requirements on our system and the first steps of the design process.

2 PEDAGOGICAL BACKGROUND

Already at the beginning of the last century, Maria Montessori (1870–1952) developed an educational approach, with the key elements independence, freedom within limits and respect [6]. The focus was set on individual learning, because learning would happen only intrinsically and thus cannot be prescribed externally [6]. Montessori postulated prepared learning environments to stimulate learning. Further, she introduced the use of adaptive learning material to stimulate autonomy [6]. Her approach preferred learning from working with materials, instead of direct instruction.

Célestin Freinet (1896–1966) and his wife, Élise Freinet (1898-1983) postulated that students should learn by collaboratively working through provided learning materials that have been partly constructed by the students themselves [7]. Further, the learning process should be self-determined by the students rather than teacher-driven. As far as possible, the students should decide what they want to learn, with whom they want to collaborate and how much time they need for it.

The Self-Determination Theory (SDT) of Deci and Ryan [3], [8] is an organismic and dialectic approach of human motivation and personality. Niemiec and Ryan found that "intrinsic motivation and autonomous types of extrinsic motivation relate positively to important academic outcomes” [9]. Moreover, they emphasize that classroom practices that support students’ satisfaction of autonomy, competence, and relatedness would be associated with both greater intrinsic and autonomous types of extrinsic motivation. Further, the SDT postulates three central innate psychology needs, with all of them relating to the intrinsic and extrinsic motivation [3], [8], [9]: (1) competence, (2) social relatedness, and (3) autonomy.

The learning theory of Constructivism, based on the work of Jean Piaget, Lev Vygotsky, and Jerome Bruner, claims that knowledge is actively constructed by the learners rather than "transferred" from any source of instruction. It is based on the assumption that "we generate knowledge and meaning through experience" and that "knowledge is both individual and social" [10]. Learning environments should support a maximum of self-control by the learner, since learning is considered as a self-driven process [11]. Reimann et al. [12] remark that learners would need support in case of arising problems, which cannot be solved by the learners themselves. Cobb [13] argues that knowledge is both constructed through social interaction and in the individual’s mind.

According to Caine [14], the "objective of brain-based learning is to move from memorizing information to meaningful learning”. Therefore, learning has to be contextual and teachers must take student interests into account: According to Caine [15], the sources of information should be quite complex, including social interactions, group discovery, individual search and reflection. Additionally, the classroom organization should support the collaborative construction of subject matter knowledge, using workstations and working on individualized projects. Many responsibilities are delegated to students, while the teachers are only monitoring.

Butler and Winne provide an analysis of cognitive processes involved in self-regulation [16]. They review several interesting areas of research, including affect and its relation to persistence during self-regulation. Further, the role of self-generated feedback in decision making and the influence of students’ belief systems on learning are investigated. They state: “For all self-regulated activities, feedback is an inherent catalyst. As learners monitor their engagement with tasks, internal feedback is generated that describes the nature of outcomes and the qualities of the cognitive processing that led
to those states." For our purpose, their model of self-regulated learning could serve as blueprint for our learning scenario, see figure 1.

Fig.1. Model of self-regulated learning according to [16].

The learning strategy of peer instruction was developed by Eric Mazur at the Harvard University [17]. He is working with specific content related conceptual questions, “which probe students’ understanding of the ideas just presented. […] Students then discuss their answers with others sitting around them; the instructor urges students to try to convince each other of the correctness of their own answer by explaining the underlying reasoning” [17]. Several surveys have demonstrated that this method works quite well. It seems able to enhance the learning success dramatically in some cases [17], [18].

In 2006, the General Assembly of the United Nations adopted the Convention on the Rights of Persons with Disabilities [19]. It demands that all countries have to ensure inclusive education at all levels. Separate schooling for disabled students should be cancelled and all students should be integrated into common mainstream education. Obviously, specific assistive technologies will be one of the key factors for the success of this educational inclusion [20].

3 TECHNOLOGICAL PREREQUISITES

Social networks connect people. This can be done in two different ways, which can be combined. For one thing, users can add each other to their friends list [21]. Like in the "real world", friends on on-line platforms are more likely to collaborate than users who do not know each other [22]. Werdmuller et al. [21] mention that (virtual) friendships are created by shared fields of interest. Besides bilateral friendships, communities are connecting users with shared interests. Liccardi et al. [23] describe communities as "informal groups of people that develop a shared way of working together to accomplish some activity". They emphasize that the membership of a community is "usually self-selected and self-organized". Typical components of communities supporting collaboration are forum, file management and wiki [21].

Massive Open Online Courses (MOOCs) became an educational buzzword in 2012 and have enjoyed wide media coverage in the popular press [24]. The first course presented under the name MOOC took place in 2008. In contrast to traditional ways of teaching, where the size of participants is restricted, MOOCs have to be easily scalable, which causes a need for different technologies to provide or support this scalability[25]: peer-support, gamification, learning-analytics, (peer-)grading, verification of identity, validation and plagiarism control. Up to now, three prominent technical platforms for MOOCs have been established: Coursera, edX and Udacity, which have their origins at American elite universities.

The term Ubiquitous Computing was created by Mark Weiser [26]: “Specialized elements of hardware and software, connected by wires, radio waves and infrared will be so ubiquitous that no one will notice their presence”. Two very interesting projects that aims to incorporate all kinds of electronic devices into learning processes are Kids in Media and Motion (KIMM), conducted by the University of Lübeck, see www.kimm.uni-luebeck.de and its preceding project ArtDeCom [27]. One of the goals was
to resolve the frontier plane of the screen between the ICT systems and the learner, for instance by conduction learning projects with handheld devices in real environments as cities.

In 2011, the US National Institute of Standards and Technology (NIST) has published its commonly well-accepted definition of Cloud Computing [28]: “Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.” Furthermore, the publication lists three Service Models (Software, Platform or Infrastructure as a Service). For myLearnSpace, the first one is relevant [28].

4 RELATED WORK

In 2004, the International Schooling for Tomorrow Forum organized by the OECD developed a set of six scenarios for schooling in the future up to 2020. On the summarizing website [29], the scenarios are classified in three categories: (1) Attempting to maintain the status quo (2) Re-schooling – major reform and renewal of schools and (3) De-schooling – widespread disestablishment of school systems. In the original publication document of the scenarios [4], the crucial role of ICT is explained. Additionally, the learning scenarios are detailed. From our point of view, our vision is a combination of the scenarios 2.b (Schools as Focused Learning Organisations) and 3.a (Learning Networks and the Network Society ICT).

In 2006, Microsoft has published a vision of future education that reflects the impact technology can have on policy and practice [30]. Microsoft used these scenarios to explore possible scenarios for learning in the future. Based on a scenario-planning, process education was explored “through the lens of work, examining educators, learners, and administrators in the context of creating, synthesizing, absorbing, sharing, and managing information”.

In principle, a PLE is composed of all tools that a person uses to support learning [31]. Typically PLEs support learning in three main fields: (1) the learners are supported in setting and achieving their own learning goals, (2) learners can use PLEs to manage learning content and their own learning process [32], and (3) PLEs are based on the paradigm of social construction [33]. Hence the communication with other learners should be facilitated. In consequence, a PLE has to be related to social network systems [31].

According to [32], PLEs have the following goals: “facilitate easy sharing, search, and retrieval of relevant knowledge and resources, help connecting people and provide easy-to-use tools for collaboration, especially around curriculum design, leverage social tools and data visualization techniques to highlight popular content as well as address burning issues and questions; provide members visibility into the relevant activities and projects, and avenues for active participation, support curation of the many activities the vCoP supports, afford low barriers to sign-up and participation, and provide materials to help newcomers to get started, and incorporate features to allow busy educators to keep up with – and participate in – ongoing discussions and activity on the site”.

5 THE LEARNING SCENARIO

A comparison of the learning theories presented in section 2 shows that most of them recommend the following essential elements of successful learning processes: (1) activation and autonomous working of students, (2) collaboration among students, and (3) contextualization of learning tasks. Based on these elements and in respect of the increasing diversity, we suggest the following “learning scenario of the future”.

The overall organizational structure could still be quite traditional: a teacher is teaching 1-2 subjects and takes care of several classes or courses in these subjects. Every student attends classes in about 15 different subjects, depending from the grade and the type of the school.

The individual learning processes are promoted mainly by learning tasks, which are assigned to the students individually by the teachers. The students work on these tasks in small groups for 1-2 weeks, trying to solve problems on their own or by asking peers. They should ask the teacher only if this is absolutely necessary. The teachers are monitoring their progress and their motivation level. The individual learning tasks would be quite different from the simple “homework-assignments” that are currently assigned in most cases. They have to be put in a thrilling and motivating context that is related to the students’ experiences. This context has to be tailored individually, for instance according gender
or personal disabilities. The basic goal for the students during the task is to acquire competencies in the sense of Weinert [34], who stressed competencies may be composed of several facets: ability, knowledge, understanding, skills, action, experience, and motivation. Apparently, the learning tasks will have to be quite complex, yet separable in different completion stages, called milestones. The completion of a milestone has to be reported by the students to the teachers by submitting certain artefacts, for instance a text document, a drawing or a tangible device. Again, the nature of these artefacts may depend from individual attributes of the students. The nature of the learning tasks may vary broadly. From simple summaries of texts, books or websites over the conception of systems, solution of mathematical or physical tasks to the collection of a portfolio that consists of elements of different nature. Regarding the collaborative work on projects, this could be subdivided into different learning tasks for each of the participating working groups.

The timetable of a certain class is only rudimentary. In each subject the students have to attend about one introductory lesson and one presentation meeting per 2 weeks. Assuming that these meetings take about one hour each, it results in about 15 hours per week in a traditional classroom. The rest of weekly working time (about 25 hours in all-day-schools) would be freely disposable for teamwork on individual tasks.

We could estimate the workload of teachers according to this scenario, based on the figures of a typical secondary school, for example in Germany. It has about 1000 students in 8 grades and about 100 teachers. In each grade the students have to attend in average about 14 different subjects. Thus, each student needs in average about 14 “subject caretakers”, which results in about 14000 “teaching cases” overall. In consequence, each teacher has to take care of about 140 teaching cases (or about 5 traditional classes). If he or she is working 45 hours a week (except holidays), teaching about 5 hours per week traditionally (equivalent to 1 hour per class), for example giving in introductory lectures or supervising student presentations, and working 10 hours on the preparation of lessons and assignments, the remaining time for individual supervision would result in 13 minutes per week and student. This is not satisfactory, of course. Yet, if we assume that the students are working in teams of 3 members, each teacher would have to take care of about 47 teams. For each of them he or she could spend about 40 minutes a week, nearly equivalent to one traditional lecture. In summary, this seems feasible, provided that there is strong support by Information Technology.

In the terms of the model for self-regulated learning of Butler and Winnes ([16], see figure 1), the teacher assigns the tasks, trying to link it to the prerequisite knowledge of the students. The goals are negotiated with the students. Additionally, advice for tactics and strategies is given to the students. Their performance is assessed according to the quality of their products (representing milestones or final outcomes). The external feedback comes from the teacher and from peers.

In our opinion, the task processing should principally (not exclusively, but in most cases) take place in the following steps.

The teacher organizes the introduction into a new learning topic. This should provide information about the topic and its relevance for the students, suitable contextualization and activation of students’ prerequisite knowledge. Additionally, most intended competencies require certain knowledge that has to be provided by some kind of information input. All provided information has to be accessible (barrier-free) by all students of the course. This requires that the teacher has to provide suitable access for instance to students with visual or auditory disabilities. This activity might take place (at least partly) in a traditional classroom, which is no more necessary for the following steps until the presentation. According to the individual abilities of the students and the respective (also individual) learning objectives, the teacher assigns different suitable, comprehensive tasks to groups of 2-3 students and agrees with the students upon the working schedule and the intended outcome of the task (solution or product). To unburden the teacher from the production, this input should come mostly from suitable prebuilt information sources, which could be analogue, originating from haptic or printed media as well as digital, e.g. from MOOCs. Nevertheless, the teachers still will have to select, restructure, recombine or reprocess original information out of different sources for this purpose.

The students work for 1-2 weeks on each task. Thus, each student has to work on many tasks during the school week. As this work is performed without prescribed timetable, students are free to choose on which task they will work at a certain time. Nevertheless, there will be some restrictions, because the team members have to meet or because some specific resources are needed. The tasks are subdivided in milestones. If a milestone is accomplished, the students report this to the teacher. The teacher inspects the working progress and gives feedback. If problems arise, the students try to solve these by themselves as far as possible. For this purpose, supported by a PLE, peers are contacted...
that are working on the same learning topic. Given that this assistance by PLE would not be restricted to the same school, age group, and region, there would be plenty of people that could help.

As soon as the students have completed a task, they approach the teacher and ask for acceptance of the solution. Depending on the outcomes of the work, the teacher will give feedback, demand further improvements or accept the product for presentation. In this case, the task outcome will be presented at the next presentation meeting of the whole class or course, aiming to communicate the results and seeking final feedback from peers. From time to time, the class is given a summarizing task that aims to integrate the results that have been presented by all class members.

The outcomes of the tasks in combination with the quality of the presentation are certified and graded by the teacher. Potentially, the teacher might demand an additional oral examination about the task, e.g., to assure and test individual learning progress, verify originality, defend plagiarism or to decide different performance levels of the team members. At the end, the outcome of a school career of a certain student will consist of the collection of certifications of tasks. Depending on number, completeness, requirements, quality or performance of this collection, different graduations may be rewarded. By this way, the separation of students in different school types (as Gymnasium, Middle School or Main School in Germany) could become obsolete.

6 REQUIREMENT ANALYSIS

We presented this scenario to the members of a regional media advisory board, which is supervising about 70 schools. Afterwards, we asked these 8 experienced teachers to develop use cases of their own choice using sheets with a simplified version of the use-case template of Cockburn [35]. Every interviewee was demanded to create and describe one use case. Then, every use case was presented and discussed. The participants detected problems, suggested extensions, and some use cases were combined or generalized. Mostly, the suggested use cases related to collaborative learning, for instance “students help students”. The system should match students to tutors according to their needs, skills, and time possibilities; students should be able to ask questions to the community receiving a fast and personal answer. Four of ten submitted use cases referred to assessment, for instance to the performing of a peer review, or to the creation of assessment forms consisting of different weighted assessment criteria. One use case represented the personalization of the PLE. Additionally, some general requirements for PLEs were discussed: support of collaborative work, gamification, support for individual promotion of students, assigning tasks to students according to their skill level or work speed. Altogether, the discussed use cases and requirements covered only particular aspects of the system, but they gave an overview of its scope in total.

Aiming to explore the requirements and ease the communication with potential users, we constructed six prototypes of system components up to now. The first was intended to explore the ontological structure and focused on the support of lesson planning by teachers (PrepSpace, see [36]). The second was developed by A. Mühling in the context of his dissertation, representing a system to edit and manage concept maps (CoMapEd, see [5], [37]). Four more prototypes have been developed by computer science teacher students as software development projects. They implemented prototypes of the user management module, the curriculum module, the Wiki system and the core of the task management. During the development stage of these projects, about 20 use cases MyLearnSpace of were elaborated in detail.

Being well aware of the performance capability of current E-Learning systems, we are not intending to reinvent all their accomplishments. We are regarding Moodle (www.moodle.org; recently ranked as the top E-Learning system among the “Top 100 Tools for Learning 2014”, see c4lpt.co.uk) as the reference system for E-Learning platforms and assume that our PLE should have at least the functionality and features of the current Moodle version 2.7. In consequence, the following requirement analysis will only address functionality that is not (or at least not in the desired extent) featured by Moodle.

In principle, according to the central elements of our learning scenario (see section 5), the PLE should provide the following basic functionality: (1) task management: support in finding, designing, assigning and managing learning tasks, their processing and their outcomes, (2) collaboration management: support in finding and managing peers for collaboration and (3) media management: support in finding and managing learning material, media and other artefacts.

MyLearnSpace should be accessible everywhere the students and teachers are able and willing to work on it. On the one hand, this requires the accessibility by desktop or laptop computers as well as by handheld devices as smartphones or tablets. On the other hand, the data have to be stored on a
central server that is accessible by all these different devices. In general, the PLE should be accessed via a normal web-browser. Yet, for mobile devices, which are often restricted in the use of internet, an App would be more appropriate.

The need of inclusive education as prescribed by the UN Convention on the Rights of Persons with Disabilities [19], raises the requirement of being barrier-free as far as any possible. In consequence, all material must be displayed (at least as far as possible) by all perception channels that are technically available (haptic, visual or auditory channels). For this purpose, modern assistive technology has to be integrated or properly interfaced, for instance screen readers or Braille displays. Auditory materials as sound recordings have to be transcribed as far as possible.

The role management has to distinguish the different types of users and their access permissions. Up to now, we have identified the following groups, each represented by a specific role, ordered by decreasing permission extent: Programmers, System Administrators, Curriculum Admins, Teachers, Parents, Students, External Contributors and Advertisers/Sponsors. The Teacher role has to be explicitly awarded by the supervised students respectively their parents in case of minority.

As any other ICT system, the design of a PLE has to consider issues of information security, privacy and data protection. Depending from the types of data, the demands in this regard vary from “very low” to “high” on a 5-point Likert scale. The lowest value might be valid for the learning content, as long as it is strictly separated from user content, which has the highest demands on data protection. The latter could be eased by using pseudonyms (in agreement with the teachers) instead of the real names of the students. As it concerns the “engine” of the system the administrative content should be treated on the same security level as the most sensible other content.

7 DESIGN OUTLINE

Basically, the data (content) of the PLE could be subdivided into learning related content (tasks, learning materials and their metadata, communication elements like wiki entries, blog entries or forum threads), user related content (role, personal data, school context, grades etc.) and administrative data (list of tags, structure of metadata, information about the specific hard- and software environment, version control, permission lists of the user groups, etc.).

To support the basic functionality, the learning content of MyLearnSpace is organized around the “main topics” of the relevant curricula, corresponding more or less with the main chapters of typical curricula or schoolbooks. In the curricula of our home state, we estimated about 10 main topics per subject and year, for instance “irrational numbers and square roots” or “prism and cylinder” in an exemplary curriculum of mathematics. If we assume that the set of main topics is similar for each school subject over all states and countries, we would have to set up about $15 \times 10 = 150$ topic rooms over all grades per school subject. The internal knowledge structure of these topics will be represented by a
collaborative concept map, see [38]. The integration of new curricula and topics or of changes in the already integrated ones will be taken over by certain distinguished teachers in the role of Curriculum Admins.

Apparently, this structuring principle is helpful regarding the management of learning material. For the task management this seem natural also, because all the tasks are related to learning objectives which are closely related to those “main topics” of the curricula, representing the knowledge part of the learning objectives (see [39]). Finally, the collaboration management will be much easier if the peers would be gathered around the curriculum topics they are seeking help for.

Due to the diversity of existing curricula in different countries or school types, the same topic may appear in different grades. Therefore, each topic will be represented technically by a topic tag, which can be assigned to all learning content elements by the users. In consequence, searching content by giving a certain topic tag, the user will find content elements regardless of the country or the school type of its origin. By this way a student of grade 8 in Gymnasium could collaborate with a peer that attends grade 9 of Middle School in a different state.

To organize the learning and task content, we will apply our Educational Ontology [36] in a slightly adopted form. Its core part is displayed in figure 2.

As the students are working on topics of (about 15) different subjects simultaneously, we propose to organize the student's view on the learning and collaboration content in Topic Rooms, one per “main topic” of each curriculum. At the end, all relevant (according to rating systems) learning content elements that are available for the student will be displayed at the respective Topic Room, arranged by their access functions, see figure 3.

The preferable view on the task content will be the Task Room, both for teachers and students. Basically, the task view will present the individual progress in the task processing, reporting and displaying the status of milestones and referring to submitted artefacts and feedback documents. While the student’s view is (naturally) restricted to his/her own tasks, the teacher has access to an overview of the task processes of all his students.

According to the accessibility requirements, 3-tier architecture seems appropriate. The presentation layer will be represented by ordinary Web-Browsers, eventually supported with some local logic, implemented e.g. by JavaScript. Alternatively, we will design specific Apps for the most popular platforms of handheld devices (e.g. iOS and Android). The functionality of the PLE will be located on central servers, similar to the data management.

Basically, MyLearnSpace comprises the following modules, which are partly implemented in the prototypes already: (1) administration, managing users, roles, access permissions, communities, (2) content, managing curricula, topics, tasks, documents and artefacts, (3) representation, comprising editors for specific content as formula or concept maps, and (4) communication, comprising subsystems for wikis, rating, blogs and forums.
8 CONCLUSION AND FUTURE WORK

As already mentioned, MyLearnSpace is clearly ahead of its application context. Although the anticipated learning scenario may already exist in some very progressive schools, it will definitely take substantial time, resources and efforts to put it into practice in mainstream schools. A glance on the pedagogic background (see section 2) might even suggest that this will never be the case, considering the long time that has passed since the first stakeholders of the progressive educational movement like Maria Montessori had postulated similar change in the classroom. Yet, we are convinced that all these changes will happen, finally forced by the prescribed inclusion of all students in regular classes.

Nevertheless, despite or even because of its visionary character, we are convinced that it is high time to start the development of an ICT system that supports future learning scenarios out of several reasons. The most important one is that these scenarios will not make the breakthrough without supporting software, due to the increased workload of teachers or because of missing support for collaboration with peers. Another reason is that it offers great research perspectives in empirical pedagogics as well as in computer science, even if our learning scenario is only realized in some avant-garde classes.

Anyway, we will go ahead in the development of MyLearnSpace. The next step will be a Bachelors Thesis about the system and its requirements, just being written by the co-author of this paper, followed by a pilot implementation at a Gymnasium in Munich. Based on the evaluation of this experiment, we will proceed in the development of our Personal Learning Environment for self-determined, active and social learning.

REFERENCES


