SOCIAL MECHANISMS TO MOTIVATE LEARNING WITH REMOTE EXPERIMENTS

Design choices to foster online peer-based learning

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Abstract: If we consider knowledge to be the result of a negotiation process about references and meaning between individuals, then, we should consider it also a collective or social property. This view underlies numerous initiatives worldwide providing unrestricted online access to educational content, software tools, and implementation resources, commonly referred to as Open Educational Resources (OER). In earlier research on the use of Open Educational Resources at the *organization*, we addressed the issue of sustainability of OER projects in terms of organization, motivation, types of resources, types of reuse, and funding and revenue models. In this paper, we focus on how social mechanisms can contribute to increase motivation amongst stakeholders to maintain and create useful content, and engage in meaningful interactions within learning communities.

1 INTRODUCTION

The UN Declaration of Human Rights declares universal access to education (United Nations General Assembly 1948). Publishing educational resources on the Web increases access to learning materials to those that have Internet access. Assuming that connectivity will keep on increasing, the Open Educational Resources (OER) movement is a positive initiative that improves access to educational resources on a global scale. Still, the provision of educational resources is not the same as education. Education is more than a Powerpoint presentation, syllabus, or reading list. It includes structured guidance and feedback, mentoring, assessment, building relationships, and in most cases accreditation. There is a gap between this conceptualization of education and the current OER-projects. Most OER-projects are so-called Open Courseware initiatives, bundled in the global OCW-consortium. Universities in this consortium invest resources to share their courseware online for free.

Lately, we have seen initiatives that add pedagogical support and tools to support interaction and communication between peers about content (Downes 2008). Social software is used to move online learning from consumption of information to co-creation, peer-production, and communication about learning resources. Examples, including commercial ones, are Learnhub, NIXTY, P2PU (Peer-to-Peer University), WatchKnow, and Curriki.

In 2008, an EU-initiative called *project* started. "*project*" is the acronym for the

"*project*", an initiative of eight universities and three enterprises, for the mutual exchange of and access to virtual laboratories (simulation environments) and remote experiments (real laboratories which are remotely controlled via the internet). *project* builds a portal, which grants the access to virtual labs and remote experiments. It includes services like a scheduling system, connection to library resources, a tutoring system, and an authoring tool. Moreover, *project* creates an organizational framework for the exchange of experiments between institutions and for the access to experimental setups. Supporting this, *project* provides contract templates for institutions and didactical help for lecturers for the integration of remote and virtual experiments into curricula. Primary target groups of *project* are university teachers and their students in undergraduate and graduate classes of the natural sciences and engineering.

In an earlier work, we have described strategies to sustain management of e-Lab Learning (author et al. 2010). We introduced strategies for industrial collaborations, short and long-term sustainability issues, and didactics of sharing remote experiments online. In this paper, we will highlight the design choices of *project* from the perspective of motivating meaningful interactions and learning with *project*.

Our paper is structured as follows. In section 2, we introduce our understanding of learning that is relevant in online environments such as the *project* portal. Section 3 describes why motivation and engagement are so crucial in these learning processes. In section 4, we show what kind of social mechanisms to foster motivation are included in the design of the *project* platform. Our conclusions are to be found in section 5.

2 LEARNING IN ONLINE ENVIRONMENTS

In community-oriented learning environments, learning relies on voluntary participation of members of the environment. In these environments, peer-support and guidance should be supported and encouraged. Through social software, intuitive design, and intelligent support, learning from remote experiments and virtual laboratories can (and should) happen between students online. This paper describes the challenge, and our design, to motivate enough people (both students and teachers) to participate in peer-based learning system. Dealing with constraints in time and resources, not all suggestions have been implemented in the project, but what we give here is a framework that describes how social mechanisms influence the behaviour of students and teachers who are using and contributing to *project*. These mechanisms can be used in the design of both technology and processes to support peer-based learning and increase interaction in online communities.

The general question we start from is: How can we foster development, online sharing, and learning from remote experiments? More specifically, we want to know how social mechanisms should be addressed in the design in order to improve collaborative learning in *project*.

2.1 Learning as constructing meaning

According to constructivist learning theories, humans construct knowledge and meaning from experience (Vygotsky & Cole 1978; Bruner 1991; Piaget & Cook 1952). Constructivist educational theory focuses on concept development and deep understanding, rather than behaviors or

skills, as the goals of instruction (Amory & Seagram n.d.). Personal development and deep understanding happens through the construction of meaning by the learner self, not through transmission from one person (the teacher) to another (the learner). The fundamental principle of constructivism is that learners actively construct knowledge through interactions with their environment (Hout-Wolters et al. 2000; Rieber 1996). Therefore learners are viewed as constructing their own knowledge of the world.

The central point of social-constructivism is an individual's making meaning of knowledge within a social context (Vygotsky & Cole 1978). Learning as a social practice is well established and dialogue is one of the corner stones of social constructivism. This makes online communities such potentially effective places for learning, because it allows for both synchronous and asynchronous interactions through a number of modalities. The drawback is that the online environment is not similar to face-to-face environments in terms of trust and interaction. Interactions in online communities are maintained through a sense of community and social capital through information flow, altruism, reciprocity, collective action, identities, and solidarity (McLure-Wasko & Faraj 2005; Kollock 1999; Bouman et al. 2007; Ackerman et al. 2004). These are central elements that need attention in an online social learning context. Social mechanisms that address internal cohesion and sense of community are important for learning and overall sustainability of a social learning environment, and so are mechanisms that impact interaction with the external environment (Hennis & Kolfschoten 2010), including reputation and recognition.

2.2 Learning as knowledge creation

Learning is situated, which means that it is located in the process of co-participation and in the field of social interaction, not in the head of individuals to get an inter-subjective understanding and meaning of something (Lave & Wenger 1991). In communities, learning means moving from the peripheral (lurking, being introduced into processes, people, etc) into the center (sharing expertise, making decisions). Peripheral participants do not accumulate knowledge and skills but are introduced in processes, routines, networks, relevant issues, and approaches within the community (Allert 2004).

Learning as knowledge creation is seen as the epistemological foundation of CSCL, Computer Supported Collaborative Learning. Paavola, Lipponen and Hakkarainen explain the “knowledge-creation” metaphor of learning as follows; “Learning is seen as analogous to processes of inquiry, especially to innovative processes of inquiry where something new is created and the initial knowledge is either substantially enriched or significantly transformed during the process” (Paavola et al. 2004). Hence, learning goes beyond the information given and engages the learner to participate and contribute. Allert writes that in modern knowledge societies, there is a need for scenarios that focus on collaborative processes of creating innovative knowledge (Allert 2004). This type of learning comprises of open, ill-structured problem solving processes, focuses on communication and collaboration. Stahl emphasizes that meaning is collaboratively produced in a cultural context, embodied in a physical or semantic artefact, and is situationally interpreted within a community or social system (Stahl 2003). He refers to learning

as shared meaning making, which is not understood as a psychological process which takes place in individuals' minds but as an "essentially social activity that is conducted jointly - collaboratively -- by a community, rather than by individuals who happen to be co-located". Meaning is not transferred from one thinker to another, but is constructed.

New developments in the science of learning also emphasize the importance of helping people take control of their own learning. Since understanding is viewed as important, people must learn to recognize when they understand and when they need more information. Effective learning environments therefore focus on sense-making, self-assessment, and reflection on what worked and what needs improving (Stahl 2003; Paris & Winograd 2003; Stahl et al. 1999; Siemens 2005). Assuming that people are unique learners, with different background and learning behaviour, they also have a different experience level. According to Jonassen (Jonassen et al. 1993, Jonassen 1997) and Rosenberg (Rosenberg 2006) this should also be taken into account when designing learning activities. Three levels of experience are distinguished: early development, competent and experienced, expert. A newcomer needs good formal and structured learning to acquire basic knowledge and skills in an appropriate fashion. More experienced employees with more knowledge and skills are better served with a largely informal learning situation that better fits ad hoc learning needs. Informal learning describes learning through everyday embodied practices, refers to horizontal knowledge and takes place in less structured, non-educational settings (Malcolm/Hodkinson/Colley, 2003). This kind of learning is related to its social context and is based on the communication and collaboration of learners. For people with expert knowledge and experiences, highly formal and structured learning can even become counter-productive, because it does not fit the very personal learning needs. When designing an online Learning Environment, one should take into account these individual learning needs. The differences between learners can play an important role within community building and motivation processes, when it comes to collaboration between beginners and experts.

2.3 Networked learning

We understand learning as a lifelong, self-directed and collaborative effort, in which one engages with people and finds resources online. Educational technology and institutions should focus on supporting this process, and guide students in assessing and evaluating knowledge they encounter online. Leaders at learning institutions need to adopt a more inductive, collective pedagogy that takes advantage of the collaborative and participative spirit of our era and the potential of the internet to connect people, link information sources, and support creativity. Rather than individual learning based on competition and hierarchy, a more networked model of learning is preferred, because it allows learning from peers, and stimulates cooperation, partnering, and mediation (Davidson & Goldberg 2009). Veen, Lukosch and de Vries describe a pedagogical approach for networked learning, presented below (Veen et al. 2008).

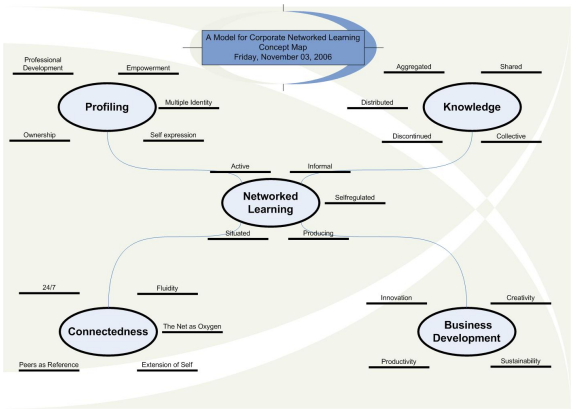

Figure 1: The Networked Learning Model (Veen, 2006)

The ingredients of the Networked Learning model can be seen in the above figure. There are four complementary areas that play an important role in knowledge development. Each of the elements that are connected to these areas is relevant for this development process in which the technology is a major facilitator for processes of communication, information retrieval and information sharing. These areas are: Profiling, Connectedness, Knowledge and Business Development.

'Profiling' states that individual users should take ownership of their professional development, ICT enabling them to do this through social software tools. A way for teachers of profiling is act as a tutor (individual online support, for example in forums), coach (general support on specific areas), or scaffold (provides handhelds for students to bring them further), and instructor (writes instructions and manuals). Students can also profile their presence as helper and peer-tutor, or as a critical but just evaluator of learning materials.

'Connectedness' stands for the connection between people and people and resources. It relates to social networks and the way interaction and human relations are relevant for people to perform in communities. These communities are fluent; you can take part for some time depending on the purpose of the community. Communities are based on peer references and are not limited to office hours.

'Knowledge' is the area that defines content and information in the Network Learning Model. This content is distributed and discontinuous, stored in databases. Learners have to aggregate bits and pieces (modules) into a meaningful whole. They do this collaboratively, sharing their expertise with others.

'Business Development' is the area that describes the major companies' business goals, what they offer and for what purpose. These goals form a reference framework within which learning takes place, it provides the organizational context.

Networked learning focuses on interconnectedness between people and between people and resources (Veldhuis-Diermanse et al. 2006; Laat & Lally 2003; Vries 2008; Laat 2006). Technology is used to integrate delivery of knowledge with interaction, communication and application (Jones & Steeples 2001). The earlier mentioned concept of Communities of Practice (Wenger 2000) is integrated in Networked Learning, because learning practices and social practices are interconnected, the learning practices emerge from participants rather than be imposed by facilitators, learners are involved in concrete practical actions together, learning is not designed, rather designed for, variation in levels of expertise can expand the group's learning, networked learning needs to support visits to "otherness" (Paavola et al. 2004).

The above describes adequately the learning philosophy and design approach for *project*. Even though online communities and social software can be

used for learning, it still remains a big challenge to motivate students and teachers to participate in these environments, if they are not rewarded grades and/or money. In order to make the environment sustainable and self-organizing, we have to find ways to motivate the users in other ways. Before we discuss this, the next part will shortly explain our understanding of the relationship between motivation and learning.

3 THE ROLE OF MOTIVATION IN ONLINE LEARNING PROCESSES

Self-organization and peer-based learning in online communities can become an important and effective mode for learning. Supporting people to create new communities has the potential to improve communication and support sharing of critical information and knowledge. It also aligns with newer organizational views: moving from command and control to more competency-based virtual communities (Koh et al. 2007). Despite the popularity of online social networking sites, most initiatives fail to reach momentum and fade away shortly after inception, because individuals lack the motivation to be active (Butler 1999; Hennis 2009; Hennis 2009). In many online communities and websites that rely on community participation, the majority of the contributions are done by a very small percentage of members (Ortega et al. 2008).

According to Bonk and Reynolds (1997), online learning should create challenging activities for learners to connect new information to old. Learning in online environments is thus heavily influenced by social interaction. Motivation plays an important role in online learning environments, understood as behavior referring to the choices people make and the degree of effort learners are willing to exert. Thus, the concept of motivation is defined as the organized pattern of a person's goals, beliefs, and emotions that the person is striving for (Ford, 1992).

In online learning environments, motivation is a force to arouse, give direction to, continue, and choose a particular behavior (Wlodkowski, 1985). Course design, available interaction and the role of the facilitator seem to be factors influencing learner's motivation (Bonk & Reynolds 1997). Furthermore, rewards such as grades and feedback seem to be important in matters of motivation (Rotter, 1990; Lepper & Malone, 1987).

In summary, overall understanding of the factors that influence motivation of individuals in online knowledge environments can be used to increase willingness to invest time and share knowledge. The following section summarizes crucial mechanisms that influence motivation of individuals in online knowledge environments, and their willingness to invest time and share knowledge, based on (Hennis & Kolfschoten 2010).

4 SOCIAL MECHANISMS OF THE *PROJECT* PORTAL TO FOSTER MOTIVATION

In the following, we describe social mechanisms that can be addressed in order to increase motivation to participate in Open Educational Resources (OER) projects. We have applied this framework into the design of processes and technology of the EU-funded project called *project*. The portal disseminates and aggregates remote experiments, learning resources

(including assignments), and lessons. A lesson is a set of learning activities that contain *project* content, such as experiments and learning resources.

4.1 Objectives, relevancy and fit: Who are the users?

One of the most important things in the design of an online community is its alignment with the interests of the intended participants, and the collective characteristics of the community (Preece & Maloney-Krichmar 2003; Preece & Maloney-Krichmar 2005). A person only contributes when this effort helps to satisfy a need (i.e. psychological needs) (Kollock 1999). If a person perceives as if a technology brings personal benefit, participation will be more likely (Pearson 2007; Rashid et al. 2006; Garfield 2006). It is therefore required to know the problems and objectives of (future) users. When potential users and contributors can relate this to their own needs, there is higher probability of participation (Preece & Maloney-Krichmar 2003). For example, a clear statement of the site's purpose is a common way to communicate its objectives and relevancy. Other possibilities include regular reminders, feedback messages, supportive and explanatory notifications, online statistics and email newsletters. In addition, it is important that the online environment and functionalities support practice, like learning processes, identity building, and networking (Bouman et al. 2007). It should also be easy for people to start participating and make use of the offered technology. The technology should fit in both the mental mindset of an organization or a person, as well as the physical workflow and organizational processes. The norms, values, language, technology and interface must correspond with the worldview of future users and problems must solve real-world problems, such as inability to find relevant people and learning resources. It can be wise to make use of existing structures, and to see when and how these can be integrated.

The primary audience of *project* consists of university teachers and students. Because it is an "open resource", anyone could make use of it, but preferential treatment regarding the use of scarce resources (popular or expensive remote experiments) is given to partnering institutes. In an internal review of pedagogical scenarios amongst 5 European universities, we identified different scenarios regarding the use of experiments. The use of experiments in education ranges from teacher-centered education to student-led education. A whole range of learning scenarios can be thought of within the two ends of the spectrum. The strategy we chose to accommodate the different learning scenarios is by offering tools that support both teacher- and student-led learning. Two examples are given below:

1. SCORM compliancy. Remote experiments, and other *project* materials are packaged as LLO-files (*project* Learning Objects) that are SCORM-compliant. SCORM is the most widely used educational metadata standard. LLOs can therefore easily be integrated into popular learning management systems, such as Blackboard and Moodle.

2. Active learning and peer assessment. Students can personalize their learning in embedded forums. Each lesson allows for users to ask questions and give answers. In addition, we designed a peer-assessment tool to support students to assess each other.

Next to "consumers" of *project* content, we have the content providers, who are the institutes and individual experiment owners (teachers etc.) who potentially want to share

their remote experiments online. The same motivations for people to share OER (Hylén 2006) seem to apply to remote experiments. Potential content providers have reacted enthusiastically on the possibility of sharing their remote experiments, which they have been developing over the years, with a global audience. With sufficient support, and high quality feedback, and the ability to make use of other *project* resources, contribution is likely to occur. Currently, a widespread survey is being done in order to find out more about potential content providers and their willingness to contribute.

4.2 Leadership & Roles

Leaders in online communities can be important for the success of the community. In addition, leadership is an enabler for knowledge sharing (Ardichvili 2008). Leaders support and engage people, form connections, discuss strategies, choose content and technology, and show exemplary behaviour (Koh et al. 2007; Wenger et al. 2002). Online communities typically provide roles such as an administrator. Oftentimes, communities do adopt specific names to assign to community-specific roles. For example, a discussion leader in a forum on boats could be called "Captain". A typical role is the technology steward, who is someone with enough experience of the workings of a community to understand its technology needs, and enough experience with technology to take leadership in addressing those needs. Stewardship typically includes selecting and configuring technology, as well as supporting its use in the practice of the community (Wenger et al. 2009).

project members have a personal page where they can add their field of expertise. In addition, users can indicate their role as a student or teacher. This information is used to tweak the portal's interface based on the role of a user. For example, when a teacher visits the homepage, it will emphasize things like "How to download experiments into your LMS", and "Pedagogical tips & tricks". Role definition and processes are an important issue that still needs to be addressed.

4.3 Organization

With regards to organization, sustainable online communities should offer services along four dimensions: self-management (facilitation of creation and management of presence and resources), self-organization (facilitate interaction and knowledge construction), self-categorization (support classification and evaluation of contributions), and self-regulation (offer tools to manage privacy and spam) (Berlanga et al. 2009).

There is much debate about the sustainability of the project from the organizational perspective. Reliance on a central organization seems costly and less feasible. Therefore, the design of *project* focuses on the decentralization of adding, managing, and learning from *project* content. One example of decentralization is given below. Teachers and students are able to guide themselves through the site, and are recommended other, possibly relevant experiments, based on the location and interests. Information about the use and users of experiments is shown, to support the decision process of an individual about whether or not he/she should do the experiment. In addition, teachers and students are able to rate and comment on resources, aggregate them into unique lessons, add keywords, and even contribute materials.

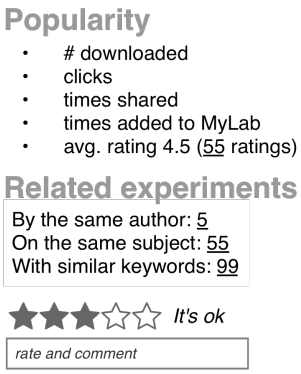

Figure 2: Self-organization through rating and recommending technologies

4.4 Heterogeneity

Uniqueness and social comparison can encourage participation and sharing of information (Ludford et al. 2004; Chen et al. 2009). Generally speaking, heterogeneity is an important factor for knowledge creation in online communities. In order to bring together different perspectives, there has to be an open dialogue, and different levels of participation must be accepted. Large and small contributions (such as comments) are needed to sustain and create new interaction. Because true membership grows over time and with interactions, passive members may over time become active and engaged (Berlanga et al. 2009; Wenger et al. 2002). It also means that different people must be addressed in different ways (Kollock 1999).

project is a European project, which means that different partners have different cultures and backgrounds. The future users of *project* will have different educational and cultural backgrounds, and are learning or are experts in different scientific domains. In our pedagogical report, we wrote that this heterogeneity should be utilized in the learning process. For example, collaborative assignments can be designed that require input from different disciplines. Also, heterogeneity is accommodated in the metadata, which allows for translation of content.

4.5 Learning & Networking

We mentioned relevancy as requirements for an online community to become successful. One important incentive for people to join and participate in learning communities, is of course, their ability to help you learn something (Bouman et al. 2007). Learning can relate with heterogeneity in expertise, support for questions, and getting useful recommendations (automatic and social). Another essential motivation for people to join online communities is networking. Networking leads to new trust relationships and collaboration. It is especially effective when online and offline interactions reinforce each other (Koh et al. 2007; Wenger et al. 2002). Relationships are established through social presence, empathy, and trust, possibly by means of community managers or moderators (Preece & Maloney-Krichmar 2003).

Learning is the core of *project*. As we mentioned before, we accommodate different learning scenarios, from traditional classroom teaching to active and networked learning. In the design, we focused on supporting the download process, the reservation process, and providing templates for teachers on how to use the materials in their own teaching. Additionally, to support online learning, we have developed a number of tools, including recommending technologies, rating and peer-support through forums and a specialized tutoring system to support learners during learning activities. Also, automatic emails are sent that contain interesting contributions and comments on content one follows.

Students and teachers will only keep on visiting *project*, if they benefit from it. The benefits may relate with learning, but an important incentive for OER providers is also the ability to connect with peers and get feedback. Online, you are able to follow persons, so if someone you find interesting adds a new resource, you will be notified. Offline, we organize several meetings and visit conferences to increase and improve the *project* network.

4.6 Reputation & Identity

Reputation relates to the concept of online identity and trust and is a primary research focus in Web science1. Overview of past actions and participant identification helps to create and sustain trust relationships in communities (Moore & Serva 2007).

Trust forms the basis of a relationship and is one of the most important enablers of community participation (Ardichvili 2008) and sharing knowledge (Lee 2008). Reputation is used as virtual currency (World of Warcraft), can be a conduit for trust (eBay), and the information stored in reputation profiles is used for recommendations of people and content. Howard Rheingold describes status, recognition or prestige as a key motivation of individuals' contributions to the group (Rheingold 1993). This is especially true in knowledge-sharing communities, and forms an important motivation for people to contribute (Lampel & Bhalla 2007; Pearson 2007). Recognition satisfies a person's need for self-esteem, as depicted in Maslow's hierarchy of needs (Kollock 1999). People tend to contribute knowledge when it enhances their professional reputations (McLure-Wasko et al. 2009; McLure-Wasko & Faraj 2005). Increased recognition also supports identity building and belonging (Bouman et al. 2007). Visibility of contributions is similarly important: if people see their contributions being used and re-shared, they are more inclined to share more information, especially when there is some recognition or praise or encouragement (Endres et al. 2007). Many communities have therefore features that show the level of contribution of individuals in ranking or increased visibility.

In Open Source communities, programmers are motivated not only by intrinsic aspects, i.e. engaging in an activity out of pure pleasure, but also have in mind the signaling knowledge to potential employers of profit-oriented companies (Von Hippel 2005). The motivation of managers in OSS projects, as well as of programmers can be traced back to career plans, which makes the reputation one has within a community so essential (Lattemann & Stieglitz 2005).

We suggested a reputation architecture that motivates individuals to be engaged in processes that ultimately contribute to the sustainability of the portal. For *project*, we argue that these include organizational processes of quality management, contribution and aggregation of content, creation of knowledge, and managing discussions. Also, helping out people with questions and providing feedback on requests are attributed. The reputation architecture monitors the interactions and

contributions, and creates human readable profiles of someone's online activity on the portal. The interpretation of this activity can be done by teachers, students, or others, and will depend on the objectives for interpretation.

4.7 Reciprocity & Feedback

In addition to reputation, there is reciprocity, the social norm that describes the expectation of people to respond to each other in kind, both in a positive and negative sense. People expect something to get in return from others. Even though reciprocity is not always an essential element (McLure-Wasko & Faraj 2005b), many online communities and social network sites encourage reciprocity with rewards and acknowledge helpful responses (Preece & Maloney-Krichmar 2003).

We have suggested a feedback tool for teachers to share their experiences on experiments and pedagogy. Teachers, as consumers of remote experiments, are asked to review the usefulness and quality of the downloaded materials. The management of quality of online resources is embedded in the download process: the teacher is asked to give some information about course and how he/she can be contacted. Through feedback by teachers, good resources are more easily found than the bad ones.

Students can ask questions and engage in discussions about theoretical or practical issues. Registered *project* members are notified of changes and new discussions, responses, and added content. If someone posts a question, he or she expects to get a response in time. Hence, each person has a personal Watchlist, and is notified through e-mail with a weekly digest of what happened on *project*.

Depending on the results of the survey amongst potential content providers, we will develop standardized contracts for content providers. These contracts will include rules for preferential treatment with regard to the use of other remote experiments

4.8 Common ground

Common ground theory provides a framework for understanding how two people or a small group develop shared understanding in a conversation (Clark and Brennan, 1991). Grounding is the process of acquiring common understanding, which is important for creating trust and establishing effective communication. Co-presence, visibility, audibility, co-temporality, simultaneity, sequentiality, reviewability, and revisability are factors that influence the grounding process (Preece & Maloney-Krichmar 2003). It is therefore influenced by both the communication task and the medium. For instance, in a chat program it can be difficult to take turns, which is clearer in a more static discussion board. Organizing offline meetings is an important instrument to establish common ground and increase participation, social cohesion and belonging. Each community has to find its own rhythm of offline events, online meetings, new information, and find its appropriate pace over time (Johnson-Lenz & Johnson-Lenz 1991).

Creating a common ground is a difficult issue for an international endeavour as *project*. Grounding occurs at typical "common grounds", such as during traditional education at universities. The *project* portal should offer the possibility to create groups with communication tools in order to have private conversations.

4.9 Privacy

Community spaces and social networking sites typically allow users to manage their online presence. They can establish private or semi-public groups to discuss in a restricted setting, start private discussions, and are able to hide specific data from non-members or specified users (Wenger et al. 2002). Grounding and the exploration of each other's interests, and discovery of similarities is supported by private spaces and the mentioning of people's expertise on the personal profile page.

4.10 Sense of community & Accountability

A "sense of community" has different dimensions, including feelings of membership, feelings of influence, integration and fulfilment of needs, and shared emotional connection (McMillan & Chavis 1986). The popularity of social networking sites show that people are likely to connect with people they know or feel affiliated with through a shared interest. On the technical level, this requires networking possibilities, and people to disclose their personal information. Because not everyone is happy with personal information being available on the Internet, privacy issues are very important. Many sites offer the possibilities to indicate contact preferences and the visibility of personal information. Having a personal profile also means that misbehaviour can be traced back, and the culprits removed from the environment.

Obviously, in order to engage in conversations on *project* and to contribute, one has to register. Personal profiling facilitates both networking and accountability. With sufficient high-quality content in a domain, a sense of community will emerge that will set standards on quality and behaviour.

4.11 Newcomers

In many online communities, most activity comes from of a small core group of experienced people. It can be difficult for newcomers to participate and to have enough confidence to contribute (self-efficacy, see next paragraph). Newcomers, therefore, should be treated carefully and given considerable attention. Administrators or technology should be focused on supporting early interactions (Burke et al. 2009). Newcomers who witness friends or relatives contributing, become accustomed to sharing content (in a social and technical sense) and continue to contribute themselves.

When people signup, in *project* we ask for some information, including background and affiliation. Using the affiliation of a person, we can connect newcomers with active members and other newcomers, making newcomers more comfortable. Also, we developed a static information pages containing the relevant information to be able to contribute or make use of *project*.

4.12 Self-efficacy & Social comparison

The perception people have about themselves and their ability to perform a specific task is called self-efficacy. Self-efficacy is the central cognitive mediator of the motivational process (Bandura 1997). In other words, if a person does not have a positive perception about his or her ability to do or contribute something, the (s)he will not do it. This also applies to knowledge sharing (Endres et al. 2007). People are more likely to share knowledge when they

see peers doing it. Also, in social comparisons, self-efficacy may increase and therewith the likeliness of sharing. Next to one's perception of own skills, belief in each other's skills and expertise increases the intention to share individual knowledge (Ludford et al. 2004; Chen et al. 2009). The earlier mentioned recognition and praise is similarly important.

project members must be able to contribute in small, easy steps. For example, adding a comment is very easy, and can give someone the confidence of starting a discussion, or reviewing a solution. Additionally, users can simply indicate that they find a resource, comment or experiment useful. When people get positive feedback, and are recognized for their contributions, they are more likely to contribute.

5 CONCLUSIONS

In this paper, we elaborate on our design of the *project* using a number of social mechanisms, defined in an earlier study as to support motivation of individuals in online knowledge environments. The framework supports designing for motivation by focusing on social and psychological factors that influence the way people behave and share information online.

In projects where Open Educational Resources must continuously be contributed, created, updated, managed, reliance on a central authority is costly and sometimes not feasible. We linked this problem with current approaches on learning, which address a more active, creative, and conversational way of learning. In addition to support for individuals to connect, discuss, assess and create learning materials, an OER project must also address their motivation to communicate, collaborate and learn. With social mechanisms, we can look for solutions and support our design choices.

In our further research on *project*, we are going to focus on evaluating and merging individual social mechanisms. Evaluating the use of the portal and the behavior of the users will become a crucial part of the online environment itself and thus an additional functionality to foster motivation with providing feedback to the users.

REFERENCES

Ackerman, M. et al., 2004. Communities and Technologies: An Approach to Foster Social Capital? Practice, 406-408.

Allert, H., 2004. Coherent Social Systems for Learning: An Approach for Contextualized and Community Centred Metadata. Journal of Interactive Media in Education, 2004, 1-30.

Amory, A. & Seagram, R., Educational game models: conceptualization and evaluation. Journal of Higher Education, 17(2), 206–217.

Ardichvili, A., 2008. Learning and Knowledge Sharing in Virtual Communities of Practice: Motivators, Barriers, and Enablers. Advances in Developing Human Resources, 10(4), 541-554.

Bandura, A., 1997. Self-Efficacy: The Exercise of Control 1st., Worth Publishers.

Baraniuk, R.G., 2008. Challenges and Opportunities for the Open Education Movement: A Connexions Case Study. In T. Iiyoshi & M. V. Kumar Opening up education - The collective advancement of education through open technology, open content, and open knowledge. Cambridge, MA: MIT Press, pp. 229-247.

Benkler, Y., 2005. Common Wisdom: Peer Production of Educational Materials.

Berlanga, A. et al., 2009. Guidelines to Foster Interaction in Online Communities. In R. Koper Learning Network Services for Professional Development. Berlin, Heidelberg: Springer, pp. 27-42.

Bonk, C. J. & Reynolds, T. H., 1997. Learner-Centered Web Instruction for Higher-Order Thinking, Teamwork and Apprenticeship. In Khan, Badrul Huda Web-based Instruction. Englewood Cliffs, New Jersey pp. 167-178.

Bouman, W. et al., 2007. The realm of sociality: notes on the design of social software, Amsterdam.

Brundtland, G.H., 1987. Our Commons Future.

Bruner, J., 1991. The narrative construction of reality. Critical inquiry, 18(1), 1–21.

Burke, M., Marlow, C. & Lento, T., 2009. Feed me: motivating newcomer contribution in social network sites. In Proceedings of the 27th international conference on Human factors in computing systems. ACM, p. 945–954.

Butler, B.S., 1999. When is a Group Not a Group: An Empirical Examination of Metaphors for Online Social Structure, Pittsburgh.

Chen, Y. et al., 2009. Social Comparisons and Contributions to Online Communities: A Field Experiment on MovieLens. American Economic Review, 1-51.

Cornell, a. & Martin, B. L. The Role of Motivation in Online Instruction. In Khan, Badrul Huda Web-based Instruction. Englewood Cliffs, New Jersey pp. 93-100.

Davidson, C. & Goldberg, D., 2009. The future of learning institutions in a digital age. The MIT Press, 81.

Downes, S., 2007. Models for sustainable open educational resources. Interdisciplinary Journal of Knowledge and Learning Objects, 3, 29–44.

Downes, S., 2008. Places to Go : Connectivism & Connective Knowledge. Innovate, 5(1), 6.

Endres, M. et al., 2007. Tacit knowledge sharing, self-efficacy theory, and application to the Open Source Community. Journal of Knowledge Management, 11(3), 92-103.

Ford, M., 1992. Motivating humans: Goals, emotions, and personal agency beliefs. Newbury Park: Sage Publications, Inc.

Garfield, S., 2006. Ten reasons why people don't share their knowledge. KM Review, 9(2), 10-11.

Giles, J., 2005. Internet encyclopaedias go head to head. Nature, 438(7070), 900-1.

Hargroves, K. & Smith, M., 2005. The Natural Advantage of Nations. In Business Opportunities, Innovation and Governance in the 21st Century. London: Earthscan/James&James, pp. 7-25.

Hennis, T.A. & Kolfschoten, G.L., 2010. Understanding Social Mechanisms in Online Communities. In Group Decision and Negotiation 2010. Delft.

Hennis, T.A., 2009. Platform voor promovendi - Lessons learned leidt tot achtstappenplan. Intellektueel Kapitaal, (4), 36-40.

Hennis, T.A., 2009. Platform voor promovendi - Valkuilen op de werkplaats. Intellektueel Kapitaal, (3), 40-42.

Hout-Wolters, B.V., Simons, R. & Volet, S., 2000. Active Learning: Self-directed learning and independent work. In R. Simons Springer. Kluwer Academic Publishers, pp. 21-36.

Hylén, J., 2006. Open educational resources: Opportunities and challenges. Open Education, 11.

Johnson-Lenz, P. & Johnson-Lenz, T., 1991. Post-mechanistic groupware primitives: rhythms, boundaries and containers. International Journal of Man-Machine studies, 34(3), 395-417.

Jonassen, D., Mayes, T., & McAleese, R., 1993. A manifesto for a constructivist approach to uses of technology in higher education. In T.M. Duffy, J. Lowyck, & D.H. Jonassen (Eds.), *Designing environments for constructive learning* pp. 231-247.

Jonassen, D. H., 1997. Instructional Design Models for Well-Structured and Ill-Structured Problem-Solving Learning Outcomes. In: Educational Technology Research and Development 45 (1): 65-94.

Jones, C. & Steeples, C., 2001. Perspectives and issues in networked learning. In Networked learning. Springer-Verlag New York, Inc., p. 14.

Koh, J. et al., 2007. Encouraging participation in virtual communities. Communications of the ACM, 50(2), 68-73.

Kollock, P., 1999. The Economies of Online Cooperation: Gifts and Public Goods in Cyberspace. In M. Smith & P. Kollock Communities in cyberspace.

Koohang, A. & Harman, K., 2007. Advancing Sustainability of Open Educational Resources. Issues in Informing Science and Information Technology, 4.

Laat, M.D. & Lally, V.I., 2003. Complexity, theory and praxis: Researching collaborative learning and tutoring processes in a networked learning community. , 7-39.

Laat, M.D., 2006. Networked Learning. , 7-9.

Lampel, J. & Bhalla, A., 2007. The Role of Status Seeking in Online Communities: Giving the Gift of Experience. Journal of Computer-Mediated Communication, 12(2), article 5.

Lattemann, C. & Stieglitz, S., 2005. Framework for Governance in Open Source Communities. Proceedings of the 38th Annual Hawaii International Conference on System Sciences, 00(C), 192a-192a.

Lave, J. & Wenger, E., 1991. Situated learning: Legitimate peripheral participation, Cambridge Univ Pr.

Lee, H., 2008. The effects of socio-technical enablers on knowledge sharing: an exploratory examination. Journal of Information Science, 34(5), 742-754.

Lepper, M. R., & Malone, T., 1987. Intrinsic motivation and instructional effectiveness in computer-based education. In R. Snow & M. Fars (Eds.) In aptitude, learning and instruction: Cognitive and affective process analysis pp. 255-286. Hillsdale, NJ: Erlbaum pp. 255-286.

Ludford, P.J. et al., 2004. Think different: increasing online community participation using uniqueness and group dissimilarity. In Proceedings of the SIGCHI conference on Human Factors in computing systems. New York: ACM, pp. 631-638.

Malcolm, J., Hodkinson, P., Colley, H., 2003. The interrelationships between informal and formal learning. In *Journal of Workplace Learning Vol. 15, no 7/8*.

McLure-Wasko, M. & Faraj, S., 2005. Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice. MIS Quarterly, 29(1).

McLure-Wasko, M. & Faraj, S., 2005. Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. MIS Quarterly, 29(1), 35-57.

McLure-Wasko, M., Teigland, R. & Faraj, S., 2009. The provision of online public goods: Examining social structure in an electronic network of practice. Decision Support Systems, 47, 254-265.

McMillan, D. & Chavis, D., 1986. Sense of community: A definition and theory. Journal of Community Psychology, 14(1), 6-23.

Moore, T.D. & Serva, M.A., 2007. Understanding Member Motivation for Contributing to Different Types of Virtual Communities: A Proposed Framework. In SIGMIS-CPR '07: Proceedings of the 2007 ACM SIGMIS CPR conference on 2007 computer personnel doctoral consortium and research conference. New York: ACM, pp. 153-158.

Ortega, F., Gonzalez-Barahona, J.M. & Robles, G., 2008. On the inequality of contributions to Wikipedia. In Proceedings of the 41st Annual Hawaii International Conference on System Sciences.

Paavola, S., Lipponen, L. & Hakkarainen, K., 2004. Models of Innovative Knowledge Communities and Three Metaphors of Learning. Review of Educational Research, 74(4), 557-576.

Paris, S. & Winograd, P., 2003. The role of self-regulated learning in contextual teaching: Principles and practices for teacher preparation. Preparing Teachers to Use Contextual Teaching and Learning Strategies to Improve Student Success in and beyond School.

Pearson, E., 2007. Digital gifts: Participation and gift exchange in Livejournal communities. First Monday, 12(5).

Piaget, J. & Cook, M., 1952. The origins of intelligence in children, International Universities Press New York.

Preece, J. & Maloney-Krichmar, D., 2005. Online communities: Design, theory, and practice. Journal of Computer-Mediated Communication, 10(4).

Preece, J. & Maloney-Krichmar, D., 2003. Online communities: focusing on sociability and usability. In J. Jacko & A. Sears Handbook of human-computer interaction. Mahwah, New Jersey: Lawrence Erlbaum Associates Inc. Publishers, p. 596–620.

Rashid, A.M. et al., 2006. Motivating participation by displaying the value of contribution. In Proceedings of the SIGCHI conference on Human Factors in computing systems - CHI '06. New York, New York, USA: ACM Press, p. 955.

Rheingold, H.L., 1993. Virtual Communities and the WELL. GNN Magazine, (1).

Rieber, L., 1996. Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. Educational technology research and development, 44(2), 43–58.

Ripamonti, L., De Cindio, F. & Benassi, M., 2005. Online communities sustainability: some economic issues. The Journal of Community Informatics, 1(2), 63–78.

Rosenberg, Marc, 2006. Beyond E-Learning. Approaches and Technologies to enhance Organizational Knowledge, Learning, and Performance.

Rotter, J., 1990. Internal versus external control of reinforcement: A case history of a variable. American Psychologist, 45, pp. 489-493.

Schmidt, J.P. & Surman, M., 2007. Open sourcing education: Learning and wisdom from the iSummit 2007,

Siemens, G., 2005. Connectivism - A learning theory for the digital age. International Journal of Instructional Technology and Distance Learning, 2(1), 3–10.

Stahl, G., Koschmann, T. & Suthers, D., 1999. Computer-supported collaborative learning: An historical perspective. In S. Sawyer Cambridge handbook of the learning sciences. Cambridge, UK: Cambridge University Press.

Stahl, G., 2003. Meaning and interpretation in collaboration. In B. Wasson, S. Ludvigsen, & U. Hoppe Designing for Change in Networked Learning Environments: Proceedings of the International Conference on Computer Support for Collaborative Learning (CSCL '03). Bergen: Kluwer Academic Publishers, pp. 523-532.

United Nations General Assembly, 1948. Universal Declaration of Human Rights. Wikipedia.

Veen, W., Lukosch, H. & Vries, P.D., 2008. Improving organizational learning through Networked Learning. In GI2008. pp. 22-31.

Veldhuis-Diermanse, A.E. et al., 2006. Analysing Learning Processes and Quality of Knowledge Construction in Networked Learning. The Journal of Agricultural Education and Extension, 12(1), 41-57.

Von Hippel, E., 2005. Democratizing innovation 1 ed., Cambridge, MA: the MIT Press.

Vries, P.D., 2008. Networked Learning for Lifelong Learners. Journal of documentation, (September), 26.

Vygotsky, L. & Cole, M., 1978. Mind in society: The development of higher psychological processes,

Watson, R.J. et al., 2010. Sustainable Management of Industrial Collaborations in E-Lab Learning. In REV2010 Conference (accepted). p. 7.

Wenger, E., McDermott, R. & Snyder, W., 2002. Cultivating communities of practice: A guide to managing knowledge, Boston, MA: HBS Press.

Wenger, E., White, N. & Smith, J.D., 2009. Digital Habitats; Stewarding Technology for Communities 1st., Portland: CPsquare.

Wenger, E., 2000. Communities of practice and social learning systems. Organization, 7(2), 225-246.

Wiley, D., 2006. On the sustainability of open educational resource initiatives in higher education, Paris.

Wlodkowski, R. J., 1985. Enhancing adult motivation to learn. San Francisco: Jossey-Bass Inc.