

Designing Virtual Portfolios for Communities of Practice

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Abstract

This paper addresses the problems of engagement, interaction and collaboration in distributed web-based learning. It reviews, treats and discusses these problems from the learning theoretical perspective of *communities of practice* as presented by Etienne Wenger (Wenger 2000), with reference to past and future web-based designs. Finally, the paper suggests the concept and principled design of virtual portfolio as a pedagogical tool to be implemented in the virtual environment for the enhancement of distributed collaboration in web-based learning.

Keywords:

collaborative learning, knowledge building, dialogue, interaction, instruction, meta-communication, virtual environments

Target group:

designers of Web-based courses, instructors

1. Introduction

Web-based environments seem to offer a promising and qualitative potential for distributed CSCL (Computer Supported Collaborative Learning) on the one hand, while it presents us with complex challenges in terms of student engagement, interaction and, collaboration on the other. The problems of engagement and interaction in collaborative processes in distributed Web-based learning appear to be recurring phenomena, often stated by the literature (Kaye, 1992; Mason, 1993; Sorensen, 1997; Dirckinck-Holmfeld, 1990; Fjuk, 1998). It seems to be a stubborn feature in the delivery of distributed CSCL on the web that collaborative initiatives and processes – in their broadest sense – have a hard time coming into existence (Sorensen, 1997).

The searching for reasons to these problems and ways of solving them have produced a variety of foci and initiatives, all of which are resting on different assumptions. The role and communicative behavior of the instructor as a unit of analysis has received a considerable amount of attention, based on the assumption that the teacher's behavior in the virtual learning process to a large degree is responsible for a lacking engagement and interaction among students (Davie, 1989; Feenberg, 1989). Another concern has addressed the nature of the collaborative activities implemented in the learning process, based on the assumption that a main reason for lacking interaction and collaboration most likely were to be found in the way the distributed collaborative tasks and activities were designed (Collis, 1996). There is no doubt that both of these research perspectives deal with very pertinent aspects of virtual learning designs and deliveries, but equally unlikely that they constitute the whole story.

What characterizes these perspectives, however, is that both assume the main cause of the problem concerning interaction and collaboration to lie in the instructional and pedagogical aspects of the learning process. There are alternative studies concerned with the nature and quality of the virtual environment and its ability to support interaction. One illustration of this is the design of the Virtual-U environment, which can be viewed as a result of design efforts especially directed towards facilitating and scaffolding collaborative

interaction in web-based learning (Sorensen, 1999). Other perspectives concerned with collaboration, e.g. as a broader and more "tangible" concept than linguistic interactions, most often are to be found among software designers, developing shared tools like e.g. shared documents or shared whiteboards to facilitate "tangible" (non-verbal) collaborative (inter)actions in web-based learning.

Discussions around collaborative learning designs often mirror a latent perspective that collaborative learning is more or less synonymous to collaborative (linguistic) interactions. Only few studies seem to view and be dealing with the linguistic interaction among student on the one hand and the non-linguistic collaboration among students on the other, as two sides of the same coin.

On the basis of experiences from two web-based courses, this paper presents the hypothesis, that implementing a shared (group) virtual portfolio, in which linguistic and non-linguistic collaboration among students is associated situatedly in time and space, will support student engagement, interaction and collaboration and, thus, enhance genuine collaboration in learning (Wenger 2000; Salomon, 1995; Sorensen, 1999). In one of the experienced cases attempts were made to provide especially structures for the linguistic interactive part of the group collaboration and engagement; in the other case, it was support of the non-verbal part of the group collaboration that had the main priority.

In the paper we make the assumption that the linguistic interactions and the more tangible carrying-out part of the interaction cannot be separated from each other. We must build shared communities of practice, shared frameworks, and shared histories in order to support CSCL. The paper also argues, that structures (backgrounds or frames) for managing shared experiences, shared histories must be built into a virtual learning environment if engagement, sharedness and collaboration in learning is to flourish and unfold.

Section 2 of the paper briefly introduces the special conditions of a web-based learning process using some central concepts from the theoretical perspective of "*Communities of Practice. Learning, Meaning, and Identity*" (Wenger 2000). In section 3, both the communicative challenges and conditions specific to distributed CSCL as well as the challenges and complexities in terms of meta-pedagogy are dealt with. Section 4 provides a review of potentials of using the virtual portfolio concept so far. While section 5 gives an account of our experiences with the two cases using virtual portfolio for collaboration, section 6 forms the forum for our suggestions and visions in terms of the implementation of virtual portfolio in design of CSCL. Section 7 contains our conclusions and future perspectives.

2. CSCL and *Communities of Practice*

Collaborative learning is a powerful but at the same a fragile process. It is powerful because it is through collaboration that the dialectical process takes place, where meaning is negotiated between peers, where students have to internalize the perspectives of their peer students and alternatively reconsider own knowledge and beliefs (Fjuk & Dirckinck-Holmfeldt, 1999). Further collaboration creates a positive commitment that motivates participation and drives the learning process (Illeris 1981). Collaboration engages the participants in learning.

But collaboration is not something that easily can be added to a learning situation. As argued by Salomon collaborative learning demands that the whole learning environment being designed as an orchestrated whole (Salomon, 1995). By this he means that we have to consider everything in the learning environment including curriculum, teacher's behavior, the activities the students get involved in and the like, when designing CSCL. Salomon argues that the design of the technology itself is the least important factor in facilitating CSCL. Too a certain extent he is right in this conclusion. Computers alone are not likely to produce, as Salomon puts it, genuine interdependency that creates a need for sharing, a joint endeavor and a pooling together of minds.

Yet we believe it is wrong to underestimate the role of the technology for facilitating CSCL. The interdependency between peers that is the fundament for collaboration is dependent of tools for developing. Collaboration is not only individuals working together. There is something in-between them enabling communication, and enabling minds to focus on the same problem. There are tools where meaning is reified and participation made visible. These tools are essential for collaboration in general but for CSCL they are critical, because we have to design for all the tools that shall mediate and preserve meaning. We cannot rely on the rich field of references from the physical world, which we normally use as an aid although without

reflecting upon it. Therefore, we will claim that the less people meet face to face, the more dependent will they be of the computer tools in order to succeed in collaboration.

The design of these tools demands an understanding of how people learn in social contexts. For that purpose we will turn to Wenger and his theory of *communities of practice* where he conceptualizes a social theory of learning (Wenger, 1998). Our aim will be to include these concepts in the design of virtual learning environments and to afford an environment that support collaborative learning.

According to Wenger the core to social learning is the continuously negotiating of meaning between participants in a practice. This process is an inseparable part of practice. If there is no negotiating of meaning, neither is there a practice to be part of. This is also a process that happens even though learning is not an issue of the practice.

All that we do and say may refer to what has been done and said in the past, and yet we produce again a new situation, an impression, an experience: we produce meaning that extend, redirect, dismiss, reinterpret, modify or confirm – in a word, negotiate anew – the histories of meaning of which they are part. In this sense living is a constant process of negotiation of meaning.

(Wenger, 1998, p. 52-53)

The negotiating of meaning is an intricate process. It is not limited to language. It includes our social relations, but does not necessarily include conversations and interactions with other human beings. Wenger explains the negotiation of meaning as involving two constituent processes: *participation* and *reification*. These two processes exist in duality, affecting each other and being the source of developing each other.

I will use the term participation to describe the social experience of living in the world in terms of membership in social communities and active involvement in social enterprises. Participation in this sense is both personal and social. It is a complex process that combines doing, talking, thinking, feeling, and belonging. It involves our whole person including our bodies, minds emotions, and social relations”.

(Wenger, 1998, p. 56)

Reification ... refers to the process of giving form to our experience by producing objects that congeal this experience into “thingness” ...Reification can refer to both to a process and its product.

(Wenger, 1998, p. 58)

But since production of meaning is distributed in both reification and participation there must a complementarity between the two processes. They must compensate for their respective shortcomings, if not, the construction of meaning can be problematic.

If participation prevails – if most of what matters is left unreified then there may not be enough material to anchor the specificities of coordination and to uncover diverging assumptions.

If reification prevails – if everything is reified, but with little opportunity for shared experience and interactive negotiation – then there may not be enough overlap in participation to recover a coordinated, relevant, or generative meaning.

(Wenger, 1998, p. 65)

In a community the reificative and participative aspects form what Wenger describes as a *shared repertoire*. A *shared repertoire* is the fundamental resource for negotiating meaning in a community. It is a product of a *community of practice* over time, including routines, words, tools, ways of doing things, stories, gestures, symbols, genres, actions or concepts that the community has produced or adopted in the course of its existence, and which have become part of its practice.

Viewing CSCL as a virtual *community of practice*, one challenge will be to design tools that can constitute the *shared repertoire*. The *shared repertoire* is fundamental for social learning, but it has to be visible for the participants. We will claim that the lack of *shared repertoire* is one of the serious shortcomings to many CSCL-systems.

Later in this paper we will suggest the virtual portfolio as a promising concept for visualizing the *shared repertoire*. The virtual portfolio is interesting because it makes explicit both the reifying of meaning and the participatory aspects.

3. Challenges in designing for CSCL

“Environmental” conditions

One critical challenge in designing CSCL-systems is the lack of bandwidth in computer networks. The lack of bandwidth is the reason why the dialog is mostly text based (conference system and e-mail). It is demonstrated that there are certain qualities associated to text based communication (Fjuk & Dirckinck-Holmfeldt, 1999): The participants have the advantage of reading, reflecting and revising their arguments before sharing their knowledge to others, it is flexible regarding factors as time and place, and the turnaround times are short giving a dynamic impression. But in general text based communication is poor and limited in ways of expressions and milieu. In addition it is formal and discontinuous. This makes it difficult for immediate and spontaneous dialogs which are central when ideas are being generated and meaning is negotiated (Fjuk & Dirckinck-Holmfeldt, 1999).

The limited bandwidth makes it impossible to include the rich environment of references, which we are relying on and benefiting of in our daily communication. This environment of references consists of knowledge about how we relate to the surroundings, knowledge of objects, body language, shared experiences and the alike. The environment of references is also weakened by the fact that we are situated in different geographical and may be cultural places. The language theorist Clark (1996) characterizes the shared environment of references as a necessity for communication, calling it by the term *common ground*.

Because the technology is limited it is often concluded that net-based collaboration is demanding physically meetings face to face, in order to get to know each other, and for establishing a mutual recognition that will sustain collaboration (Fjuk & Dirckinck-Holmfeldt 1999), and for enriching the *common ground* (Clark 1996) for communication. We therefore argue that learning through collaboration and communication over the Internet is more a matter of overcoming social, mental and cultural distances than bridging physical and geographical distances.

But the lack of bandwidth is not only due to technical limitations. It is also due to the fact that we have not managed to fill the interactive and communicative environment with meanings full and supporting artifacts. It is an open space with limited history. There is little reification of experience. Whether being virtual or not, a *community of practice* demands that there are artifacts containing and shaping the *shared repertoire*.

Meta-pedagogy

As early as in 1986 Robin Mason pointed our attention to the non-authoritative character and flat structure of asynchronous virtual environments, when she said (Mason, 1994):

The democratic and equalizing tendency of computer conferencing has often been noted. Conferencing empowers grassroots discussions and even subverts traditional power structures. Access is the essence of the medium, not status.

(Mason, 1994, p. 58)

So, already then, from the very fundamental nature of asynchronous communication software, we were invited to review and change our often dusty and authoritative instructional styles and approaches, as we practice them - perhaps often unreflectedly, in face-to-face processes of learning.

As a result of such insight with respect to the communicative potential of communication software and due to negative experiences from applying the pedagogical approaches known from face-to-face learning, the role of the teacher has gained a central focus. Roy Pea has given this situation some thought (Pea, 1994):

When communication is viewed from this transformative perspective, not only students but also teachers are transformed as learners by means of their communicative activities. It is a two-way dynamic system, with important implications for what we consider changing to support transformative communications in the learning environment. Students are not blank slates written on with curricular lessons. They are active learners who have, by participating in various

cultural practices, developed substantial beliefs and ways of thinking before ever coming to school. These existing conceptions and strategies are often best met and negotiated by the teacher in a conversation. They are poorly dealt with by seeming to overwrite them with lectures and demonstrations.

(Pea 1994, pp. 289-290)

Essentially, what we are witnessing here is the support from the virtual environment to move from a focus on instruction activities to learning activities and learner-centeredness (from a teaching perspective to a learning perspective).

Assuming this change in role of the teacher to be somewhat the key in utilizing the communicative potential in web-based learning, a large amount of research attention has been addressing the functions of the online teacher. Several of these studies have produced very qualified information on appropriate behavior of the online teacher. In particular, Andrew Feenberg has brought about very insightful descriptions on the "new" needs of the online teacher to provide facilitation of online learning through the practice of meta-communicative behavior (Feenberg, 1989).

That it is the reflective distance - with a need for reflective meta-communication - rather than the involved engagement in the content which is in focus for the online teacher, finds support in recent studies of the role that the asynchronous virtual environment imposes on the learning and communication process (Sorensen, 1999). These studies also suggest that it is the whole "ontological" conditions of learning that are changed in the virtual environments. All communicative actions in the virtual environment are put at a reflective distance to the learner, not only enabling but also coaching him to reflect on (inter)actions to a much higher extent than is the case when we act in our physical environments. Perhaps, in these new "existential" conditions, we may also find part of the reason for the outspoken inertia in terms of understanding the adequate role of the tutor.

The reflective support from an online learning environment appears to be central in establishing what we see as the primary learning potential of using virtual portfolio: processes of reflection and self-reflection.

4. Virtual portfolios – up until now

Common portfolio-pedagogy

Portfolio has evolved to be a popular educational tool. It is being used in courses reaching from basic to higher education (Niguidula, 1993, Leeman, 1997/98), and it has been adopted as a tool for professional development and lifelong learning (Tenhula, 1996).

The portfolio concept is taken from artistic like professions (architectures, designers, models etc) where portfolios are used for promoting the artist. The portfolio is a showcase of hand picked material, reviews and recommendations. Likewise, a student portfolio is a purposeful collection of samples documenting the work of the student that exhibit quality and progression.

From a pedagogical point of view there are two basic reasons for doing portfolios (Arter, 1995). It is a powerful tool for assessment and it is a supporting tool for structuring and giving momentum to the learning trajectory. However these aspects are so interwoven that they are meaningless to separate. (Especially since we believe learning and assessment ought to be harmonized dimensions, which portfolios may provide.)

Our aim for using portfolios in designing virtual learning environments has been for structuring the learning trajectory focusing on learning as being constructivist experiential and social. As discussed above the limited bandwidth of net-based communication demands new tools for giving structure to the virtual environment, and we find portfolio to be a very promising tool for providing that.

However portfolio is a very open concept, and many of the constructivist approaches on net-based learning can fall under the heading of "portfolio". What it provides is a useful framework for discussing and designing student centered learning environments on the net.

Advantages of using portfolio

Our interpretation of portfolio pedagogy provide some important educational advantages in designing virtual learning environments that we will illuminate:

- It is activity oriented. The portfolio contains activities that are designed with the aim of fulfilling the learning goals of being graduated from the course.
- It is student centered. The portfolio is owned and controlled by the student.
- The student can be involved in the assessment process by having self-reflection as a portfolio activity. By letting students assess their own progress, students become shareholders in their own destiny.
- Assessment can be based on samples demonstrating authentic work focusing on the student as a problem solver.
- By selecting samples during a time period it is possible to view the progression of the student.
- The portfolio is an artifact for reification of meaning. It gives the learner a picture of the accumulated experience. Meaning is created, reified through visualization and laid open for reflection, implicitly as well as explicitly
- The portfolio can provide structure to the learning process by prescribing activities for the portfolio. It can visualize participation both as history and as future events. Structuring within course parts helps to maintain a more detailed, structured overview of course elements and supports the cognitive processes of perception, categorization, classification, recognition, and integration of details of a theme or phenomenon into a whole (Sorensen, 1996).

Doing portfolios do not automatically guaranty these benefits. They need to be planned and designed for, and they must be built into the virtual portfolio system.

Disadvantages of using portfolio

Apart from the challenges of accommodating the individual needs and preferences of learners, portfolios have some fundamental limitations:

- Portfolio is traditionally an individual tool (Tolsby, 2001). The focus is on the individual learner as constructor of knowledge. One may argue that publishing a virtual portfolio on the Web will enhance collaboration, but there is no automatic in that sharing of knowledge provides collaboration. If we want portfolio owners to get engaged in each other's work we have to design for that to be a portfolio activity.
- There can be a short line from supporting to controlling the learner. Portfolio has the potential of being a control and surveillance tool. Portfolio can be used for controlling what the student shall learn and how. It can be designed an instrumental approach where the activities in the portfolio are shaped as tasks with predefined answers, instead of problems to be solved. Seen from such a perspective the portfolio is degenerated to a structure for reproduction of knowledge, and is not a tool for experiential learning.

5. Experiences of designing for participation and verification

In order to illustrate the relation between participation and reification and their signification for the design of a virtual *community of practice* that supports collaboration, we will discuss two different implementations that both are inspired by the portfolio idea.

The first example is an implementation that strongly supports participation but where reification of meaning is limited by the environment. The second example is designed with reification as the primary goal. Students are using portfolios for constructing their individual curriculum, but they are not seeking participation in a social practice.

Participation but limited reification

This first example is a one-year distance education course on how to employ ICT in learning, offered at Aalborg University in Denmark. It was delivered mainly as distributed CSCL in a learning environment over the Web. The continuing education course attracted 36 participants from all over Denmark.

The course was carried out mainly distributed over the Web in a virtual learning environment, Virtual-U. An additional 4 face-to-face seminars were held during the one-year period.

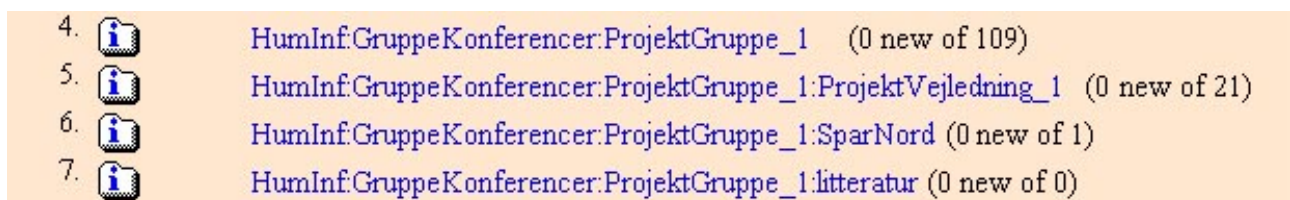
In the one-year education the project-based group works was the main activity. The supervision of the project work took place also at the face-to-face seminars, but mainly asynchronously on the Virtual-U system. In the problem-based project work, the students specialized in a particular area within the main subject. In their work they depart from a research problem, that they themselves identify and formulate, - a problem which often relates to their concrete daily work and work interests. This problem is elucidated through study of relevant literature and other types of data-collection within the area.

The students are provided with a communicative forum as the space for their project work. No other structuring "environmental" facilities are offered. As argued above a conference-system is not a rich environment, and in order to get more meaning in the dialog the students are building conference portfolios.

A conference portfolio consists of sub-conferences that structure the different activities in project work, and the students are encouraged to create new sub-conferences whenever they identify a new collaborative activity of a certain extent and significance. As seen in the example below (unfortunately in Danish), project group 2 created five sub-conferences: one for literature, one for announcements, one for project guidance, one for project steering, and for one for discussing cases.



Although sub-conferencing may be attractive for structuring the dialog, it is a limited resource for reifying meaning, which is not obvious to everyone. In fact several project groups demonstrated severe difficulties in using sub conferences. The example below is taken from project group 1. They created several sub conferences but they never used them.



Conference systems reify meaning but mainly as written text, but as argued by Wenger (1998), linguistic communication is only one of many aspects in negotiating meaning. Therefore conference systems have often proved to be a too simple a tool for supporting genuine collaboration. What conference systems do benefit from, is showing participation. A virtual conference can visualize the negotiation process as a history sorted by several optional factors as date, participators or threaded.

Reification but limited participation

The second example is a course in computer science, given at Ostfold University College in Norway, which is about LAN (Local Area Network) and intranet. It is an open and flexible course, which is attended by both local and remote students (totally 120 students).

The Course is carried out without ordinary lectures, but is organized around the structure that is provided by the student portfolio. In the course we use the metaphor of a workbook instead of portfolio. The metaphor of a book was chosen because it is a qualitative concept, which we want to associate to the students work style. A book is supposed to be thoroughly prepared and not a casual piece of work.

The screenshot shows a Netscape browser window titled "LAN and Intranet - Netscape". The address bar shows "LAN and Intranet" and "Ostfold University College". The page content includes a sidebar with links for "Courseinfo", "Workbook", "Meeting place", "Accessories", and "Participants". The main content area is titled "Workbook" and contains an overview of the workbook structure. It is divided into four chapters, with "Chapter 0: Preparation" and "Chapter 1: LAN" shown in detail. Each chapter has a table with two columns: "Themes for this workbook chapter" and "Study-resources".

Chapter 0: Preparation

Themes for this workbook chapter	Study-resources
<p>Learning goals and expectations</p> <p>Read about the course model and what is expected from you as a student.</p> <p>Describe your learning goals and your expectations for taking this course. This is the first chapter in your workbook.</p>	<ul style="list-style-type: none"> • Course model • Course description
<p>Implement a draft of your workbook on www and mail the URL to Håkon Tolsby.</p>	

Chapter 1: LAN

Themes for this workbook chapter	Study-resources
<p>Overview: Present an survey of the current technology of LAN</p>	<ul style="list-style-type: none"> • Infrastructure of LAN • TCP/IP • LAN based on NT server
<p>Case: Describe a case that you will use as an example for implementing a LAN</p>	
<p>Problem: Choose a particular problem within LAN that you will discuss.</p>	
<p>Lab-exercise: Describe your experiences from the lab-exercise</p>	<ul style="list-style-type: none"> • Preparations to the lab-exercise • Lab-exercise - LAN

The workbook is divided into four chapters, one preliminary and three main chapters covering different aspects of the subject matter. In the preliminary chapter the student shall describe his/her learning goals and motives for attending this course. The three main chapters cover important aspects of the subject matter. Each of them consists of a set of themes, which is structuring the work of the student. The themes spans from the concrete to the problem based. For the theme LAN (Local Area Network) they are supposed to give a survey of the current technology, they shall describe a "real" case to which they will prescribe solutions, they shall choose a problem that they will discuss, and they shall carry out a lab exercise where they afterwards shall reflect their experiences.

The structure of the themes is deliberately kept relatively open. It is left to the learner to be able to support themselves in their own tasks and to learn how to do things.

There is prepared a rich set of learning resources to each theme to support the students in developing their workbook. The student has the freedom to look up resources that he/she stands in need of and when required. The resources don't control the learner and he/she is free to look up external resources if desired. This means that there are a variety of ways of traversing the terrain in order to meet the problem solving approach and to answer the learner's enquiry.

Our experience from the course after researching it is that the workbook motivates the students to work in an experiential manner (Kolb, 1983). They use the workbook as an artifact where they reify their understanding. They are continuously returning to the workbook as they get more insight and elaborate on the problems, and they create workbooks based on personal experiences and interests.

They also browse each other's workbook. They compare their own workbook with others. They borrow ideas from each other, but they don't get engaged in each other projects. There is no real interaction or social participation. At a basic level they are sharing experiences but they, but they are not contributing to a shared experience.

That their knowledge is published on the Web does not cause collaboration. There is too little overlap in the social participation for negotiating of meaning. Why should they get involved in each other's workbook if they don't get anything in return? Several students even express that they find it meanings less to publish at all, and others delay the publishing of their workbook until the last hour because they are afraid of being copied. There is no common goal for sharing, no joint enterprise, no mutual engagement, and there is no construction of a *community of practice*.

6. Supporting participation and verification in a *shared portfolio*

The two examples above showed that participation and reification are essential in collaborative learning, but not easily designed for. The aim is to establish a balance between these processes in order to nurse the negotiation of meaning.

Participation and reification must be in such proportion and relation as to compensate for their respective shortcomings. When too much reliance is placed on one at the expenses of the other, the continuity of meaning is likely to become problematic in practice.

(Wenger, 1998, p. 65)

Although portfolio has been developed as an individual tool for learning, we do believe that the concept can be expanded to accommodate the processes of collaborative learning. As discussed above we consider portfolio to be a tool supporting participation in activities and reification of meaning, and according to Wenger, participation and reification are the two processes that construct meaning in a *community of practice*.

We will therefore expand the concept of portfolio and introduce the idea of a *shared portfolio*. In contrast to an individual portfolio, a *shared portfolio* is a collection of material from a *community of practice*. The idea is to bring up, visualize and, shape practice, culture, and history of the community through the frame of a portfolio.

A *shared portfolio* consists of material that can support the construction of a shared experience for the community. A shared experience consists of both individual and collective contributions, and by collecting them and making them visible and accessible for the community, a *shared repertoire* for collaboration may be established. The *shared portfolio* includes collective constructions and collective reflections, but in contrast to the conference example above, the activities are designed for, and in contrast to the workbook example the activities are collaborative.

A *shared portfolio* is not a contradiction to or instead of individual portfolios. On the contrary, a *shared portfolio* is dependent on the personal engagement that the individual portfolio provides. You cannot share and you cannot collaborate without having something to contribute. And in a digital environment you are not equipped for collaboration without a set of digital resources that can present your knowledge and experience. However individual portfolios have limited value to a learning community if they are not shared and used for collective reflection and development.

7. Conclusion/Future Perspective

We have in this paper argued the need for tools that support CSCL through reification of meaning and visualization of participation. Our experience in designing virtual learning environments has been that it is difficult maintaining a balance between these processes. Either they seem to fall into a constructivist approach with too much focus on reification or they fall into a social approach with too much focus on participation.

For the time being we have only few experiences in implementing the *shared virtual portfolio* as an educational tool. It is implemented in a course in computer science at Ostfold University College in Norway where students are working in project groups sharing a common portfolio. Further we expect to implement *shared portfolios* in a master program on ICT and learning at the University of Aalborg, Denmark.

We will emphasize, however, that there is no correct implementation of *shared portfolio*. For us the *shared portfolio* first of all is a design concept and a framework, which we can use for focusing, discussing, and implementing some fundamental, theoretical aspects of collaborative learning.

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