

Implementing a Culture of Participation as Means for Collaboration in Tele-Teaching Using the Example of Cooperative Video Annotation

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Abstract: In this paper we would like to tackle the problem of user participation, respectively the lack of it, in e-learning platforms, especially in tele-teaching environments. As the basis we use the idea of a culture of participation to analyse existing systems and suggest enhancements for them. Our aim is to help improve the active engagement and collaboration of learners with the learning material and with fellow students. First, we conduct a literature review of collaboration and participation in e-learning. Afterwards, we analyse an existing tele-teaching web portal for the implementation of the culture of participation. Design principles and requirements extracted during literature review are used for the analysis. Finally we suggest different improvements to really create a culture of participation in tele-teaching. As an example feature we use collaborative digital video annotation.

1 Introduction

There are two reasons why students using e-learning and especially tele-teaching should be animated to actively engage with the content and collaborate with fellow students. First, especially tele-teaching always has the problem that a lot of self-discipline is required from the students to follow the lecture. There is the danger that students may just lean back and consume the material without being active. But, in research about didactics it was discovered that especially the active involvement with the material is important for learning as well as the exchange with other learners. Therefore actively engaging the students in the learning process and the collaboration among students should be the goal for every online learning platform. When the single user becomes more active, the community can benefit as well. The sharing and connection of knowledge is one them.

Second, since a mass of tele-teaching content was produced in the last decade, the problem of how to filter and search through it arose. This is mainly a problem of the metadata. It is not possible for administrative personnel to add more than the basic metadata because the amount of data is so large. User generated metadata can serve as one approach to solve this issue and complement basic tele-teaching metadata, such as title and description of the lecture, title of scenes, date and time, with more descriptive metadata. It helps to

improve search, recommendation and filtering functionalities within large video data sets. Especially it helps the user who added the metadata himself to retrieve content he already viewed a second time. This means that community features generating metadata actually facilitate the search among multimedia content.

But although the utility of those functions was proven, especially smaller e-learning communities often suffer from several problems. First their member base is mostly not as large as in the huge private and free-time-oriented Web 2.0 platforms. That means that the knowledge connection and sharing may only take place among a smaller number of people and may thus be not so effective, because the key success factor for the community features is the interaction among users [MT10]. Additionally, individuals in e-learning environments are less active than people in leisure and private communities, so the participation is generally low. A study about the Web 2.0 video service YouTube [CKR⁺07] and also experience with the example portal showed this.

Recent research showed that a culture of participation needs to be implemented in order to engage users in content creation. Collaboration is no purpose in itself for users. Instead incentives need to be created in order to encourage users to join in working cooperatively..

In this paper we offer motivation with the help of literature examined from different points of view. We thus show why collaboration and participation are essential for e-learning and especially tele-teaching. We then evaluate an existing tele-teaching web portal for its user activity and culture of participation. Afterwards, several methods and functions are suggested to improve the cooperation among students. Because especially video annotation supports the generation of large amounts of metadata in a short time span, this functionality is used as sample feature to explain the approach to implement a culture of participation to more actively engage users.

2 Related Work

This paper combines different fields of study, such as computer science, didactics and psychology. Related work from each of the fields is presented in this section. The section is subdivided into the two parts collaboration in e-learning and participation in e-learning. The first part deals with the history of web 2.0 in e-learning and explains the current didactical approach incorporating web 2.0 technologies whereas the second part introduces the psychological background to collaborative work.

2.1 Collaboration in E-Learning

The collaboration started within e-learning environments when web 2.0 functionalities were introduced. That is why we want to give a brief historical summary of web 2.0 in e-learning, and especially tele-teaching, which is the specialization of our sample e-learning project explained afterwards.

2.1.1 The History of web 2.0 and E-Learning

Tele-teaching was introduced as one solution where people can learn according to their interests and learning speed, independent of time and place. Several problems could be identified with this new technology. First, the amount of data has increased rapidly in the last decade due to recording technology as for instance tele-TASK [SM02] becoming cheaper, easier and faster to use. Also a large number of students (around 23 percent [RK11]) tend to substitute the real lecture with the lecture recording. This can lead to less communication with fellow students and teachers when tele-teaching is used, because there is less face-to-face teaching and less opportunity to talk to other students.

An opportunity turned up with the era of Web 2.0, the idea of which was introduced by Tim O'Reilly [RM07]. The idea describes users joining together to communities and participating in the creation and sharing of web and media content. The benefit is that the joint force of a large number of users is able to generate more data and provide it to the group again than individuals or administrative personnel can. A number of social web and community features have been found to be helpful to the users. These include blogging, the collaborate creation of wikis, social annotation and tagging, evaluating (eg. rating and commenting), recommending, content sharing and linking of content items. Furthermore it was observed through user statistics, that fun communities made a huge impact on people and grew tremendously. This potential should be leveraged for the tele-teaching context as well.

About ten years ago it was already shown that community functionalities are not only useful for networking, but also in the learning context [PP99]. But only recently has research focused on joining tele-teaching with community functionalities. During the workshop *eLectures 2009* at the DeLFI 2009 conference [TLH09] an approach of integrating tele-teaching applications into facebook and other social e-learning approaches were shown.

2.1.2 The Didactics behind Collaboration in E-Learning

The traditional learning culture is totally different from the recent culture of learning. Whereas the old way included the learning of an area of agreed-upon knowledge within a limited time frame, presented by a teacher, the new learning culture moves away from this paradigm. The disadvantages of the traditional learning culture which include the separation of teachers and students, the dependence of students on methods the teachers chose, a synchronous learning in group and the fixed curriculum, could be overcome. The new learning culture is self-organized, constructive and in fluid networks [Kir04]. All this is possible due to new e-learning technologies that support the organization and realization of open and flexible learning scenarios.

The use of the latest e-learning technologies cannot be explained directly with the old learning theories behaviourism, cognitivism and constructivism, because those theories do not consider the technology supported side of learning [Sie05]. The more recent learning theory connectivism [Sie05], that is adapted to the digital age, supports the hypothesis that social web can be beneficial for learners. This is the case because connectivism describes learning as the creation of connections between information. Social web features

support the creation of these connections through functionalities such as tagging and the exchange of knowledge in groups. Furthermore connectivism also describes the "cycle of knowledge development" where individuals provide knowledge to a community and may also gain knowledge from the community. This collaborative knowledge creation, which is considered a very beneficial style of learning, is the core of the web 2.0 philosophy.

Since collaboration is proven to be a very effective method for learning, the question should be raised why the participation of users in cooperative learning environments is nevertheless still low. The next paragraph will introduce the latest theories about it.

2.2 Participation in E-Learning

Several researchers have evaluated the phenomenon of participation in online platforms in general and e-learning communities in particular. A study of Hostetter and Bush from 2008 showed that learning in a group is positive for supporting the individual's motivation and eagerness to engage in academic activities. Their study measured the feeling of social presence as well as user satisfaction and came to the conclusion that there is a strong correlation between them both. However, it was not possible, to link the feeling of social presence with learning outcomes. [HB08]

A study of Kimmerle and Cress in 2007 evaluated an information-exchange dilemma in which each individual had work and no benefit if he participated in a collaborative database, but the group could not perform at its best if a lot of individuals withheld information. In order to solve the dilemma a group-awareness tool was utilized. It could be observed, that the tool was used as an opportunity to provide self-presentation. Additionally, people were more willing to engage if they received individual feedback from fellow group members. [KC07]

The term culture of participation was concretized by Gerhard Fischer [Fis11] in such a way that he first suggested design guidelines for socio-technical systems wanting to apply such culture. The aim to stimulate participation. Three major components suggested are meta-design, where the infrastructure enables collaborative design, social creativity, where group of students is enabled to solve problems by collaboration and different levels of participation, which means that diverse degrees of engagement from consumer to meta-designer are supported. Fischer briefly discusses learning as field of application, where learners are encouraged to learn by developing and discussing ideas and topics as shared consensus and engaging in genuine activities and explicit problems. Fischer states that the motivation to participate is based on intrinsic motivation. Contributors will feel support from the group, see a common purpose and feel the collaborative creativity which will motivate them to participate further [Fis11].

Dick and Zietz utilize the framework for a culture of participation suggested by Fischer. They analysed different motivation techniques within a culture of participation. Social proof, social norm and peer pressure were identified as the most important motivational factors within a socio-technical system (STS). Those mechanisms can start working when there is a group of people watching its members being active within the system. This

awareness is managed by publicly displaying the activities of its members. The authors concluded that the aim for designers of those socio-technical systems should therefore be to make users more aware of their contributions and actions within the system instead of trying to make them more active. [DZ11]

In the next chapter a sample e-learning environment - a tele-teaching platform - is evaluated. The current status of the user activity as well as the implemented suggestions for a culture of participation are analysed.

3 Analysis of the Culture of Participation in Tele-Teaching Portals

We would like to take a closer look at the culture of participation in current tele-teaching systems. The analysis is based on a large and sophisticated sample tele-teaching platform. First, the example web portal shall be introduced and the user activity in the portal briefly summarized. Afterwards the realization of the culture of participation is discussed.

3.1 Studying an Existing Tele-Teaching Web Portal

Sample social web functionalities were implemented in the research tele-teaching portal of the Hasso-Plattner-Institut (HPI). The tele-Teaching Anywhere Solution Kit [SM02], short tele-TASK, is an e-learning project at the chair Internet-Technologies and -Systems and was started in 2001. The goal of the project is the recording and distribution of lectures, seminars and other presentations with as little as possible outlay in material and resources.

An all-in-one solution was developed including hard- and software for lecture recording. Two video streams (a video of the lecturer and screen capturing of his laptop or a smart-board) and one audio stream can be recorded at once. More than 4000 lectures and 11000 podcasts can be accessed free of charge via web-browser or portable device. Over 2600 users are registered with the portal, out of which 1000 are lecturers only. The archive and the web-platform tele-TASK are the basis for further research and development.

In the example tele-teaching web-portal web 2.0 functionalities were researched for quite a while. User-generated playlists, simple user-generated time-based annotations, tagging, rating and the creation of links to the content items were implemented and partly researched [GSM11]. Table 1 gives a quick overview of how many users generated how many entries for which community functionality in the portal.

Community Functionality	Users Participating	Number of Items Created	Items by Top 5 Users
Links	0.6%	20	75%
Playlists	1%	430	44%
Annotations	0.4%	1288	97.8%
Tags	1.4%	650	94,3%

Table 1: User Activity with Community Features in the Portal

From the overview of user activity it is visible, that only a very small percentage of users actually participate in the creation of additional data to the e-lectures and even a smaller number uses those functions more intense. This means that only a small number of users is actually willing to move upwards from level 0 in the ecology of participation (as explained by Fischer [Fis11]) to a more advanced level. Which activities are involved in which level of participation, as well as the current state of tele-teaching environments in comparison to the design guidelines for a culture of participation, are explained in the next section.

3.2 Status Quo of The Culture of Participation

Based on observations in our own tele-teaching web portal we would like to collect existing functionalities and methodologies and analyse their relevance for the culture of participation. First, the possibilities for the users to engage in the different levels of participation (as explained in detail in Fischer [Fis11]) will be explained with the help of examples from the tele-teaching web portal. Second, the portal shall be analysed according to the design guidelines of Fischer [Fis11] and Dick [DZ11].

Level of Involvement	Examples from a Tele-Teaching Environment
level 0: unaware consumers	When users only watch the e-lectures without being aware that they can actually create metadata to the e-lectures themselves or even be involved in the development of e-lectures, they are unaware consumers.
Level 1: consumers aware of possibilities	Users consuming the e-lectures, but knowing that they may actually influence the impact of the lecture by e.g. rating it, annotating it with meaningful tags or adding links move up to level 1. They may be utilizing some of the possibilities via a search function, but not actively participating.
Level 2: contributors, decision makers	When not only knowing about the possibilities available, but actually contributing to the creation of additional metadata to an e-lecture the users advance one step further to a contributor. Functionalities that support that behaviour are, for example, tagging, rating and the creation of links
Level 3: collaborators, facilitators, organizers, curators	Being a facilitator and organizer means mentoring other learners and organizing the content. A tele-teaching environment is one where mentoring other learners is, however, usually not designated. But, there is the possibility to be content organizer. Students can re-organize content privately or accessibly for the public through playlists, a concept mostly known from music archives, but also researched in the tele-teaching field of study [SMHM10].
Level 4: meta-designers	In a closed tele-teaching environment only the developers are meta-designers so far. Only they are able to add new functionality to the portal. Even with open source systems, like moodle, the student might be able to program a new module, but is still dependent on the administrators and developers to actually deploy it in the university system. Usually the teachers are the meta-designers in a sense of the content, because they create new e-lectures. Within a purposeful didactical scenario users can be meta-designers as well, by creating their own e-lectures. A possible teaching scenario is, for example, when students focus on separate topics regarding one subject in a seminar. They are then asked to present these topics to other students. Either their talks could be recorded and made publicly available or at least restricted to the group. Otherwise they could be asked to create podcasts as tutorials in more practical subjects, such as computer science.

Table 2: Different Levels of Participation in Tele-Teaching

From the analysis of different levels of participation in tele-teaching (summarized in table 2) we could observe, that still a lot of action needs to come from the teacher or administrator side. Either all of the teaching material must be provided by the teacher or otherwise a more complex learning scenario has to be thought of which may incorporate the creation of new teaching units by students. The collaboration and participation of students along the e-lectures created by the teachers is still restricted to a very basic level.

Next, the implementation of the design guidelines for a culture of participation [Fis11, DZ11] shall be analysed for the sample tele-teaching web portal, which is an up-to-date environment incorporating the most well-known features for such projects. Table 3 gives an overview of the application of the design guidelines.

Design Guideline	Realization in a Sample Tele-Teaching Platform
support different engagement levels	This first guideline was discussed in detail previously in table 2
support human-problem interaction	Human-problem interaction is not assisted strongly because tele-teaching does not actively encourage involvement in solving specific issues, rather is mostly used for the dissemination of new learning material. Only the thinking about problems might be encouraged through using the annotation functionality. An example where the video annotation was successfully implemented in a blended-learning-scenario was shown in [REM11]. There students in teacher training utilized the video annotation to discuss their own lectures.
underdesign for emergent behaviour	Until now the tele-teaching environments are very closed, not a lot of opportunities to extend the capability of the systems exist. Also the possibility to engage in negotiations is limited, apart from the option to use a chat functionality that is given in some tele-teaching environments. The previously mentioned blended-learning scenario is one example for the possibility to discuss and negotiate.
reward and recognize contributions, group-awareness	To honour and acknowledge the participation of people within a group of learners can be achieved through a proper learning scenario where e.g. the contributions are graded or the group is involved in the final evaluation of every participants achievements. At the moment there is no way the system supports this awareness mechanism.
feeling that behaviour is being judged	The impression that participation is evaluated and examined by fellow students is based on the recognition mentioned in the previous guideline. Since not a lot of collaboration takes place and students are not aware of the involvement of other students, this feeling of being judged cannot come up.
co-evolution of artefacts and the community	A cross-pollination between the evolving community and the resources for system development is not really supported at the moment, because the users cannot in fact be part of the system design, they may only send requests to the system developers.

Table 3: Realization of the Design Guidelines for a Culture of Participation

As shown in the two tables that provide an overview of the status quo of current tele-teaching systems, quite a few steps are missing that would be necessary to create a proper culture of participation in these environments. First, there is not much possibility for the learners to move upwards from level 2 to the levels 3 (coordinators and collaborators) and 4 (meta-designers) in the ecologies of participation. When looking at the design guidelines one can see that at the moment an opportunity for students to really engage in problem-solving and online discussion (an example how to incorporate offline discussion with annotation in tele-lectures is shown in [REM11]) when watching e-lectures is not well developed. Furthermore there are no mechanisms to allow group awareness to come

up and rewards from the group to be established. The co-evolution of artefacts and community is also missing, but is also something that is difficult to realize within a university e-learning setting. This is the case, because the university needs to ensure reliability and availability of the system if part of the curriculum is build on it. If students become system designers the quality management and the development life cycle will become an issue.

Now that it is summarized which improvements need to be considered to foster a culture of participation, the next chapter will introduce a few ideas how to do so.

4 An Approach to Improve Active Engagement by Establishing a Culture of Participation

Fischer states that a culture of participation for education and learning should focus on offering a framework for learners to discuss in groups, create a common understanding and learn from real problems and activities [Fis11]. This chapter will deal with possible solutions to reach the criteria for a culture of participation as described in the previous chapter. In the first section functionalities will briefly explained that fulfil the criteria for group implementation and may therefore be a starting point for a culture of participation.

4.1 Functionalities with the Possibility to Utilize the Collaborative Approach

In a tele-teaching environment the community functionalities can be separated in time-bound and time-independent activities. Time-independent activities are the tagging of whole videos, the creation of playlists, chat functions and forums. Time-bound activities are the annotation functionalities that utilize a timeline approach. Those include setting time markers to memorize certain positions within the video as well as textual or multimedia annotations within the video.

The digital annotation has been proven to be beneficial for students [HHF09, Zup06, SYHZ10, YCS04, REM11]. Textual annotations enable the user to browse the video content accordingly. Also it is possible not only to use descriptive free-text metadata as annotation, but also links and other media formats, like images [HHF09].

Constructive for the users is not only the additional metadata they can utilize, but also the process of annotation itself. Because it includes interpretation, reflection and weighting of the content [HHF09] digital annotation leads to a deepened understanding of the topic [Zup06]. Also it was found out, that time-based annotation serves as anchored discussion as opposed to forums and thus encourages discussions among students as well as more participation [Zup06].

As digital annotation is the most profitable functionality in connection with e-lectures because it supports the deep discussion of single aspects of the video among students, the next section will explain how a culture of participation can be fostered there.

4.2 The Example of Digital Annotation to foster a culture of participation

Digital annotation in groups supports creating a user group where each member may annotate the video at any point of time. It also allows group members to view and alter each others annotations. It is essential to tackle five issue in order to incorporate a culture of participation in this area: 1) engage more students as coordinators and collaborators, 2) involve students as meta-designers, 3) foster group awareness, 4) incorporate rewards from the group and 5) create scenarios to support problem-solving and online discussion.

In order to engage more students as coordinators and collaborators, different methods can be used. First of all the teacher could create learning groups for special purposes in a seminar. A possible use case would be the previously mentioned seminar where student have to present different topics. Their talks would be recorded. In the tele-teaching environment, the fellow learners of the presenter could use the annotation interface to discuss and criticise ideas presented or ask questions. Students may also form their own groups.

To give learners the freedom to act as meta-designer, the annotation environment needs to be designed in a more open and free manner. Namely, it should be possible not only to include simple textual annotations or pre-defined files, but a more open wiki-like annotation interface should be offered with freedom to include files as well as structure and design besides textual annotation. The user then has the opportunity to adapt the environment to his needs and utilize it in a way that works best for his learning style and context. One scenario imaginable is the utilization of the annotation environment as tool for the collaborative creation of a manuscript that can serve as basis for exam preparation or as summary of the topic.

A use-case-diagram (see figure 1) visualizes how group awareness can be created. In the diagram use cases that help to create a culture of participation are marked in grey. When a group of people works at the same annotation, it must be ensured that it is obvious which student accounted for which contribution. A rights management makes sure that only members of the group are allowed to change annotations within the group and that only publicly available annotations can be viewed by others. That means each member of the group is also entitled to have his private annotations.

If changes are made, these are stored in a history that can be accessed by each member of a group, for example on a wiki page or within a version control system. Because each and every step of each group member can be tracked, people are aware that their contribution is being judged. It is especially important that the group administrator receives a notification of every contribution. Furthermore, all contributions are counted in statistics that are visible for all group members. In that way the group is not only able to control the quality, but also the quantity of the participation of distinct group members. This is a benefit for the teacher as well in terms of grading the students, because if this participation was defined as part of the learning targets, these statistics may be used for student evaluation. Also textual group feedback could be used as method that helps grading and also functions as reward system by the group. A voting system for the best group members is another option how group reward can be implemented.

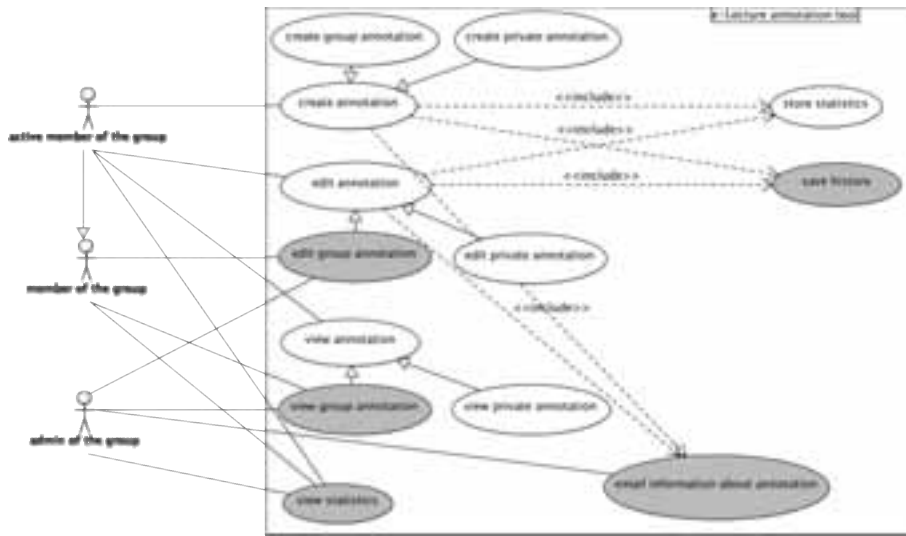


Figure 1: Use case diagram of collaborative annotation with highlights of culture of participation

An open and flexible annotation system can also be the basis for scenarios incorporating problem-solving and online discussion. In order to start this problem-solving and discussion the teacher may spread some seeds (such as explained in [REM11]). An imaginable scenario is the teacher asking questions within the lecture where it is the students' task to discuss them and document their discussion with the digital annotation. When annotating a live lecture students might even post questions at the same time as the lecture is actually taking place. At the end of the lesson the teacher then takes a few minutes to answer the questions.

The next section will summarize the findings of this paper and give a perspective on further steps of research.

5 Conclusions and Future Work

In this paper we conducted a literature review of collaboration and participation in e-learning. Afterwards we analysed an existing tele-teaching web portal for its culture of participation according to the design principles and requirements identified during literature review. We found out that in order to apply a fully functional culture of participation, possibilities and scenarios to engage more students as coordinators, collaborators and meta-designers need to be established. Furthermore problem-solving opportunities and online discussions should be provided. Also mechanisms for group awareness and rewards are missing. We suggest different solutions based on collaborative digital video

annotation as one possible feature. The most essential findings thereby are that awareness mechanisms have to be created by storing a history of all contributions to a group annotation and allowing access to statistics of all individuals' input. Furthermore the annotation environment needs to be designed with more flexibility and freedom so that individuals are able to apply their special wishes and scenarios to it. Thereby students can also be enabled to act as co-ordinator and meta-designer. Finally two scenarios are suggested how online discussion and problem solving can be started by the teacher.

In order to validate the theoretical findings we plan to implement the suggested environment within our sample tele-teaching web portal. Once the implementation is ready, the access log data should be observed in order to find out if more students actively participate. In addition user studies should be realized. The best way to do so is within a limited group of people and a distinct setting, for example during a seminar. The advantage is that the learning scenario can be adjusted to the study and thereby also a proof of concept for some of the suggested scenarios can be realized. Furthermore the students will be available for pre- and post-test-questionnaires. A learning group just for that seminar can be created which will make it possible to observe the log data for this group separately. A combination of questionnaires and log data analysis will allow a qualitative as well as a quantitative analysis of the results. But, this is a very limited setup in terms of the number of probands as well as the field of study of test subjects. Therefore, if positive results are to be gained reflecting the culture of participation, it should be repeated using learners with different learning styles and diverse subjects.

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