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# Teaching Large Classes: Increasing Learner Activity Using Wikis

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**Abstract:** In large classes teachers and students often encounter problems like lack of learning activities, lack of motivation, lack of profound feedback or lack of learning transfer. In this paper we present an approach to meet these typical difficulties by using a wiki-based collaborative e-learning scenario moving from a teacher-centred focus to a more learner-centred one. The evaluation and the final examination results indicate that the approach was successful in terms of learners' activation and learning outcome. Nevertheless, the evaluation also shows that students participating in this project did not appreciate the collaboration experience in general and valued it as time-consuming and less effective regarding the preparation of the final examination. The paper closes with the discussion of the project's findings and lessons learned.

## Introduction

Teaching large classes with 100 or more students always poses a challenge to lecturers. In particular, facilitating learner (inter-)activity and motivation is more difficult in impersonal groups of this size. Furthermore, teaching resources are often limited in a way that feedback cannot be given as detailed as in small classes. Finally, the creation of a learning environment which allows a sustainable transfer of learning is much more complex in large classes and results often in theoretical frontal teaching.

In this paper we propose an approach to meet these typical large class problems using a wiki-based collaborative e-learning scenario. In two classes covering business informatics (one with 271 students, the other one with 42 students) students were asked to cooperatively create a wiki, feedback the wiki of another group and revise their own wikis according to the feedback received following a submit-review-publish cycle.

The paper is structured as follows: After a brief outline of common problems of large classes, we describe the original status of the two lectures in which our project was conducted. In the chapter that followed, solutions as discussed in the research literature are covered. After this, the chosen solution and the design of the learning environment are introduced. Subsequent to the instructional design part of the paper, the evaluation method and the data analysis are explained. The paper ends with the discussion of the project's findings and lessons learned.

## Typical Problems Learners and Instructors Encounter in Large Classes

In large classes, students, instructors and administrators often face the well-known disadvantages and problems like lack of interaction, lack of feedback and lack of motivation as well as partly poor learning outcome (Sparrow et al. 2000). In general, these challenges cannot be encountered with personnel-intensive solutions, e.g., splitting up classes or coaching of learner groups since these would mean additional financial and human resources which are currently not available in higher education. Hence, a feasible solution for enhancing interactivity and providing feedback in large classes has to be found within the given frameset. It is already commonplace, that forms of collaborative learning have the high potential to improve learner activation as well as motivation and to make a positive impact on learning outcomes.

The project described in this paper dealt with those problems and how they were tackled. The project was implemented into two lectures at the department of informatics at the University of Zurich. The first one, "Informatics for Economics III", is the third and last part of a required lecture series addressing bachelor students of economics in their fourth semester. The second lecture "Informatics in Businesses", which is also compulsory, is given to students of informatics in their second semester of study. Whereas the latter was attended by 42 students in summer semester 2007, 271 students visited the lecture aiming at the students of economics in the same semester. Both lectures are structured similarly and cover specific examples of IT usage and deal with in-company use of

information systems and business-to-business information systems. The lectures follow a blended learning approach and combine face-to-face classes with self-directed online learning. The support infrastructure was ensured by discussion forums, consultation hours, and podcasts with the recorded lectures. To attend the final examination at the end of the semester students had to pass several assignments. Beside two professors, who gave the lectures alternately, and two research assistants, who were mainly in charge of the organization, teaching assistants and tutors helped to run the lecture. Because the responsible instructors had been faced with the recurring problems of large classes in both lectures they were looking for an appropriate solution for summer semester 2007. In particular, interactivity and providing feedback should be improved. It was suggested to work out an instructional design for one of the assignments already part of the lecture. The challenge for the instructional design was not only to incorporate opportunities for learner activities and feedback in large classes, but to do it with no significant additional financial or human resources.

## **Didactical Considerations**

As a solution a learning environment<sup>1</sup> was considered, in which students work in teams on specific tasks over a given period of time, producing a common artefact which is reviewed by fellow students. By designing and developing the learning environment the instructional design has to meet following challenges:

1. How can learner's activity be generated?
2. How can students' motivation be increased?
3. How can valuable feedback be implemented?
4. How can learning transfer be supported?

Since additional resources could not be obtained durably, the instructional design had to focus on the improvement of the existing learning environment. This means, in particular, that instructional solutions had to be designed and implemented which work without any additional (human) resources for e.g. moderating and coaching group work or for providing feedback. In order to raise learner activity and motivation and to improve learning transfer, forms of collaborative learning were considered. Peer reviewing was taken into account because resources for feedback on individual student's efforts were not affordable. As a cheap and easy to handle collaboration platform a wiki solution was favoured. In order to meet the constraints of no additional resources, in particular no additional staff for supporting learners, it was clear from the beginning that the instructional design has to focus on a clear and stable scaffold. Well designed and structured learning tasks should provide learners with a framework and guide them through the whole assignment.

## **Increasing Learner Activity and Motivation with Collaborative Learning**

Collaborative learning is about solving problems or creating an artefact together with others. Learners interact with each other in order to reach common goals. In doing so, they communicate, exchange knowledge and opinions, or negotiate approaches. By collaborating with others, learners share experiences and create new knowledge. Collaborative learning is therefore seen as a highly appropriate method for activating and motivating learners (Oakley et al. 2004; Saab et al. 2007). Furthermore, the active knowledge construction and the application of knowledge and skills are seen as a guarantee for learning transfer (Mandl et al. 2005).

Johnson et al. (2000) could show in their meta-analysis of collaborative learning methods that one of the main success factors of collaborative learning is not the approach chosen, but implementation. Hence, the scaffolding of the collaborative learning environment is crucial. The design of learning tasks and guidance with clearly communicated expectations and deadlines have a significant impact on the success of collaborative learning environments (Mandl et al. 2005; Oakley et al. 2004). Furthermore, learners, primarily when they have little experience with collaboration, need support on how to collaborate. One method is to provide learners with instructions so that learners know what they have to do (Saab et al. 2007, 74 ff).

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<sup>1</sup> Mandl et al. (2005) define learning environment as a "specific composition of teaching strategies and methods, learning material and media."

## **Feedback and Peer Reviewing**

Assignment feedback is highly appreciated by students and research has shown its positive effects on both learning and learning transfer (Gibbs & Simpson 2004; Bower et al. 2006). Primarily due to instructors' workload students often do not receive individual feedback on assignments. More often, especially in large classes, is a general feedback, which is given by the teacher to the whole class, covering topics like common difficulties or problems students encounter during the assignment. But feedback needs not to be given by lecturers or instructors. Another approach, which has become more and more popular in recent years, is peer reviewing or peer assessment. With peer reviewing learners assess their fellows' work and provide each other with feedback (Berg et al. 2006). Beside giving and receiving feedback, peer reviewing has an additional impact on student's learning. Reviewers have to deal with and reflect on other students' solutions or artefacts and can apply their reflections on their own work (Bower et al. 2006). Not least for this reason authors like Van den Berg et al. (2006) refer to the relationship between peer reviewing and collaborative learning. Both require learner activity, reflection, articulation of thoughts and opinions, as well as balancing of arguments.

Most studies report a positive impact of peer reviewing on student's learning and that students perceive this form of assessment as fair (Dochy et al. 1999; Van den Berg et al. 2006). Nevertheless, many authors stress that review criteria should be defined and published beforehand. In particular, learners who are inexperienced in evaluation and giving sound feedback need guidance and instructions on how to review (Dochy et al. 1999; Oakley et al. 2004).

## **Learning Transfer**

According to Mandl et al. (2005) transfer „implies the productive use of the knowledge and skills acquired“ and „means that the knowledge acquired does not remain inert“. Learning is transferred when knowledge which was acquainted in one context or with a specific set of materials is applied in another context. One way to stimulate learner's activation and productive use of acquired knowledge is to ask for the application of an abstract concept to a concrete problem or situation. This application should foster the elaboration of the new concepts, should make them more flexible for students to apply them to different scenarios and should foster the memorization of the taught content. Large class sizes often provide a learning environment in which learning transfer is difficult to establish and students adopt the role of passive learners.

## **Usage of Wiki Technology**

Computer-supported collaborative learning can be supported by a wiki. With characteristics like free-availability, easy usability, and web-based accessibility it is an affordable and easy to handle tool for online collaboration, which requires less support and little instruction on how to use it. With a wiki students can create shared content and results of group work can be easily made available to others like instructors or other student groups (Augar et. al. 2004).

## **Learning Environment Design**

The project was implemented in the context of one assignment which dealt with computer-supported cooperative work (CSCW). CSCW was one of the main topics in both lectures and was taught both face-to-face and online. The assignment consisted of a sequence of subtasks which follow a submit-review-publish cycle as it is known from scientific publication procedures (Bower et al. 2006). In groups of six, students were asked to develop a wiki-website to a given topic in the field of cooperative work at first and reflect on their group work and the experiences they had made afterwards. In the second subtask students discussed one of the theories of CSCW introduced prior in lecture. For the third subtask students reviewed a wiki of another group and provided structured feedback. For this the wikis, which were private during the course of group work, were released for peer reviewing. Finally, students had to revise their wiki on basis on the feedback received.

Special attention was paid to the overall instructional design of the assignment and the tasks, so that students exactly knew, what they had to do and what was expected from them. A strict timeframe with due dates for each subtask was released at the beginning of the assignment:

<b>Task</b>	<b>Due Date</b>
Publication of assignment	28 <sup>th</sup> of March
Building groups of six	29 <sup>th</sup> of March
Submission of draft version	10 <sup>th</sup> of April
Peer reviewing has to be finished	13 <sup>th</sup> of April
Revising of wiki and final submission	18 <sup>th</sup> of April

Also the overall rating for the assignment was published in the beginning. It was composed as follows:

Wiki according the evaluation criteria:	40%
Reflection phase:	20%
Peer reviewing:	25%
Incorporation of review:	15%

### **First Subtask: Developing the Wiki**

It was up to the students to build groups of six. The group building process was supported by a learning management system in which students could subscribe for a specific group. After building teams, students organized their work. The coordination and organisation of the whole group work was also in the responsibility of the students. For the wikis, students were asked to develop a wiki-site on a given task. These tasks cover topics ranging from creating a student-guide to CSCW-related subjects.

### **Second Subtask: Reflection Phase**

The students were requested to reflect their collaboration and to publish their findings on an extra page of the wiki. In particular, students should answer following questions:

- How did you coordinate yourselves (face-to-face, by e-mail or chat)?
- Which strategies did you choose for solving the task?
- How did you organize your team work? Who was responsible for what?
- Which problems did you encounter and which approaches did you choose to solve them? Which approaches did work and which did not?

In the second part of the reflection phase students should discuss one theory of CSCW which were introduced prior in lecture (e.g., Media Richness Theory, Social Influence Model or Critical Mass Theory). The students were asked to choose that theory, which covers phenomena they encountered during their own group work. In particular, students were asked to summarize the chosen theory first and then to relate from the observed phenomena to the theory.

### **Third Subtask: Peer Reviewing**

Students should not grade the work of the other student group, but give fruitful feedback so that the reviewed group could revise its wiki before submitting it for the final teacher's assessment. Students had to feedback a wiki according to following criteria catalogue:

- Information Architecture and Usability: structure and organisation of information and pages; navigation and orientation
- Complexity and Content of the Wiki: amount of information; usefulness of information; additional media like pictures, videos or animations
- Design and Layout: Are the wiki pages appealing and clearly and concise arranged? Is the overall layout consistent?
- Functionality and Correctness: usefulness of information provided; correctness of pages, e.g., links, spelling

### **Forth Subtask: Revision Phase**

Before submitting the final version, students were asked to revise their wiki according to the feedback they had received from their peers.

## Method

To gain insights into students' perception of the described assignment a summative evaluation was applied at one of the last face-to-face sessions of the lecture. The evaluation consisted of a four-page survey which was handed out during the lecture and students were given about 10 to 15 minutes to fill out the survey. Since the lecture aiming at the students of economics was also broadcasted via podcast, students were given the possibility to hand in their survey per e-mail. The survey contained of a number of statements related to the lecturers as well as to the teaching material (e.g., the lecturer explains difficult issues in a comprehensible way; the provided teaching material was helpful etc.). Students assessed each statement using a 6-point Likert scale spanning from "strongly disagree" to "strongly agree". In addition, the questionnaire contained free text boxes where students could write down their reasons for a good or a bad evaluation on the Likert scales. For this paper we will concentrate on those parts of the survey which covered the described CSCW assignment. Two statements were dedicated to this part of the lecture:

A) "The cooperative work on the CSCW assignment in groups of six using a wiki was an interesting learning experience for me." and B) "The feedback-round during the assignment appeared useful to me."

As described, students assessed these statements ranging from "strongly disagree (---)" to "strongly agree (+++)". The points between these ends of the scale were symbolized by "--", "-", "+", and "++". In addition to these two scales, a free text box was included in the survey and students were asked "Please state what you liked about the CSCW assignment, what you disliked and make suggestions how to improve the assignment".

## Data Analysis and Results

From the 271 students who took the course in the economics track 86 returned the questionnaire (53 male, 31 female, 2 missing). 83 students filled out the survey during the lecture, three students returned the survey per e-mail after listening to the podcasted lecture. The results of students assessment on the Likert scale is shown in table 1. For question A) about cooperating with the wiki the mean<sup>1</sup> resulted in 3.57. Almost half of the students (48.9%) rated the statement with a "+" or a "++". On the other hand, however, there were a comparatively high percentage of students who clearly disagreed to the statement. 29.1% judged the statement with a "- -" or even a "- - -", thus lowering the overall average. For statement B) about the third subtask (peer reviewing and giving feedback) the average turned out to be 2.99. 50% of the students chose a "+" or "-" and only 11.6% choose a "+" or "++". From the 49 students in the computer science track, 35 returned the survey (29 male, 5 female, 1 missing). Podcasts were not available for this group. On a descriptive level the agreement to the two statements by this smaller group of students was more positive. Those students judged statement A about the collaboration with the wiki with an average of 4.29 and statement B) about the feedback-round with an average of 3.79.

	Statement	Strongly disagree ---	--	-	+	++	Strongly agree +++	N	Mean <sup>2</sup>
Students of economics (group size: 271)	(A) The cooperative work on the CSCW assignment in groups of six using a wiki was an interesting learning experience for me.	14.3%	15.5%	14.3%	<b>16.7%</b>	<b>33.3%</b>	6.0%	84	<b>3.57</b>
	(B) The feedback-round during the assignment deemed useful to me.	15.3%	22.4%	<b>24.7%</b>	<b>25.9%</b>	9.4%	2.4%	85	<b>2.99</b>
Students of computer science (group size:49)	(A) The cooperative work on the CSCW assignment in groups of six using a wiki was an interesting learning experience for me.	5.7%	11.4%	5.7%	<b>17.1%</b>	<b>45.7%</b>	14.3%	35	<b>4.29</b>
	(B) The feedback-round during the assignment deemed useful to me.	11.8%	5.9%	<b>23.5%</b>	<b>23.5%</b>	20.6%	14.7%	34	<b>3.79</b>

**Table 1:** Proportional agreement to the two statements referring to the CSCW assignment (the two most frequent categories for each statement are bold-typed)

<sup>2</sup> The mean was calculated by recoding the scale ranging from 1 for "---" to 6 for "+++".

In addition to the Likert scales we analyzed the free text remarks. We coded these remarks with special attention to statements relating to learners' activity and motivation as well as to students' experience within the collaborating group. Furthermore, we focussed on the feedback experience, the perceived learning effect and the remarks on the assignment in general. Table 2 shows the categories which emerged from this analysis for the students of economics (translated from German). Most remarks were clearly positive or negative. The analysis shows that students appreciated the learning experience with other students in a group and valued the possibility to become acquainted with a wiki as a positive learning experience. On the other hand, a large share of the students (29 remarks) complained about time and effort the assignment required. In addition the relevance of the assignment with reference to the topics of the lecture was questioned. Finally, there were clearly more critical remarks referring to the feedback-round than positive ones (2 remarks vs. 8 remarks). Due to the small number of remarks from the students of computer science we did not develop a category system for this group. The few remarks showed a similar picture as the one described. Positive and problematic aspects of the group process were mentioned (2 remarks), the required effort was perceived as too high (3) and a clearer task formulation was asked for (1). In addition, the technical aspects of the wiki were discussed more often (4), e.g. "Wiki software not suitable (to cumbersome)".

Category		No. of remarks for this category
<b>Positive</b>	<b>Cooperation in group as positive learning experience</b> Examples: "...( <i>the assignment</i> ) was good to learn communication / coordination among the members of a team."; "the group process was interesting and motivating"	<b>11</b>
	<b>Becoming acquainted with the wiki as a positive learning experience</b> "Positive: Gaining insights into the development of a wiki,..."	<b>9</b>
	<b>Unspecific positive remarks</b> "...the wiki assignment was a valuable experience."; "it was fun"	<b>5</b>
	<b>Positive variation to usual assignments</b> "Positive: A variation [compared to usual assignments]"	<b>2</b>
	<b>Feedback as a positive learning experience</b> "Feedback round should be retained"; "lead to more detailed feedback"	<b>2</b>
<b>Negative</b>	<b>The assignment required too much time and effort</b> "...the required work for the assignment was out of scale and did not even count for the final grade." "Too much work required only to receive the necessary credits to write the final exam."	<b>29</b>
	<b>Assignment seemed of little relevance with reference to topics of the lecture / Usefulness of the assignment questionable</b> "In my opinion, the assignment had little relation to the topics of the lecture." "Much effort for nothing (didactical effect questionable)."	<b>11<sup>3</sup></b>
	<b>Problems with group coordination / group size</b> "It is difficult to bring six persons together (hard to find an appointment which is suitable for everybody)"; "Free-rider should be watched more carefully! Otherwise a fair grading is not possible."	<b>9</b>
	<b>Critical remarks on feedback round</b> "The feedback round was not useful in my opinion since we did not agree with certain feedbacks."; "The feedback was bad and not true"	<b>8</b>
	<b>Assignment instructions were not clear enough / it was not clear enough what to do / Given scenarios differed too much from group to group</b> "The task formulation was too unspecific."; "The requirements for the assignment as well as for the expected effort should be formulated more clearly!"	<b>6</b>
	<b>Critical remarks on the grading of the assignment</b> "The grading was not fair"; "The grading was strange."	<b>3</b>

**Table 2:** Categories which emerged from an analysis of the free text boxes (students of economic) and respective frequencies

<sup>3</sup> This category is largely a subcategory of the "too much effort" category. A number of students stated that it was too much effort considering the (learning) outcome.

## Interpretation and Discussion of Results

To encounter the problems of large classes like low student's motivation and lack of sufficient feedback we proposed a wiki-based collaborative learning environment. This setting allowed us to set up a collaborative group assignment and to provide individual feedback in a class of large size. Thus, we were able to considerably increase students' self-organized learning activity, students' team-work, and the elaborateness of feedback each student received without allocating additional resources. Because of the designed collaborative learning scenario we were able to ask students to apply theoretical concepts on CSCW, they had learned during the lecture, to situations they had experienced themselves. Therefore, a learning transfer from abstract content taught frontally to concrete real-world situations or problems was realized.

Regarding the learning outcome we can report, that both the assignment itself and the students' answers to the CSCW-related questions in the final examination met or partly even exceeded our expectations. The created wikis demonstrate that most students took the assignment seriously and made a considerable effort to deliver a product of good quality. The results of the final exam showed that most students had gained a good knowledge of the taught theoretical concepts and that they were able to apply them to example situations.

While we met our project goals like generating learners' activity, increasing students' motivation, implementing feedback and supporting learning transfer, the feedback we received from the students was quite critical. The evaluation revealed that students indeed appreciated both the collaborative learning experience and getting acquainted with the wiki-technology. But on the other side, they generally did not perceive the feedback as very useful. A considerable large share complained about the high effort the assignment required. Additionally, a number of students did not understand or did not appreciate that the group interactivity was meant to be part of the learning experience. They perceived this part mainly as a nuisance which was time-consuming and detained them from working on "the task itself". Finally, students complained that the assignment was not enough linked to the subjects of the frontal teaching lectures. To put in a nutshell, students apparently learned a lot, but they did not like it.

We see these results in accordance with experiences of other researchers (Sparrow et al. 2000; Allen et al. 2006). Learner-centred methods can lead to negative evaluation responses if students are mainly used to teacher-centred approaches. Participants told us that they were not accustomed to learning tasks that require this level of (inter-)activity, especially in large classes like ours. While the difference in the Likert scale values between the students of computer science and the students of economics is not easily to interpret, we believe that the difference is partly due to the fact that computer science students are more used to computer-based collaborative group assignments of this kind. Another aspect might be the implicit expectations of students in large classes. Students might not expect to be personally involved in classes of almost 300 students. Due to the common anonymous setting they may also experience a high personal involvement as less rewarding compared to small learner groups. It seems, that students in such conditions quickly perceive interactive learner-centred assignments as a waste of time if they don't see an immediate benefit for their final examination.

From the experiences we have made within this project we would nevertheless recommend a wiki-based collaborative approach. Due to its easy handling and high accessibility this approach provides a powerful tool to foster learning processes in large classes as they are common in higher education. However, we would advice lecturers to be aware of the didactical pitfalls which are related to learning culture and students' expectations. In particular, the following aspect should be taken into account:

- Be aware of the learning culture your students are accustomed to (teacher-centred versus learner-centred)
- Be very explicit about the objectives you want to achieve with the assignment ("Group interactivity is part of the assignment.")
- Be explicit about the positive learning outcome you expect (team work, project management etc.)
- Balance the effort for the interactive part (e.g., interacting with other group members) with the benefits of "hard facts" students might need for the final examination
- Let students use the wiki as memory repository for recapitulation before the final examination



- Be aware of providing fair and constructive feedback if you consider including peer-reviewing in your assignment. A separate lecture on how to give good feedback might be necessary since giving and receiving feedback is not a trivial task (especially for under-graduate students)

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