Exploring the "Massive Multiplayer E-Learning" Concept

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Abstract: At the Vienna University of Technology, I regularly have to give courses with up to 1000 participants. In such cases, maintaining a meaningful communication with and between students can be quite cumbersome or even impossible. This article describes an approach to change that situation for the better by designing and implementing a system that blends social software with E-Learning approaches. Such a system would transform the burden of the large number of participants into an asset, since it would benefit from a large number of users. The article presents the project vision as well as first exploratory implementations and the lessons learned from these experiments.

Introduction

Mass teaching - lectures for several hundreds of students - is an Austrian reality, particularly at the large Viennese Universities. The project described in this paper aims to improve the situation in mass lectures. The problems that can be observed in such courses - above all anonymity, lacking opportunities for discourse and feedback as well as the little room for interaction with the teachers and/or content - are to be countered by the use of new media using an approach that is commonly know as *web 2.0*. In the project described here, we don't aim for the transformation of traditional forms of lecturing through technology, but the enhancement of the course through the addition of a *structured* and *self-organized* dialog in virtual space.

The use of Web 2.0 approaches in e-Learning is a much discussed topic at the moment. Stephen Downes is said to have coined the term *E-learning 2.0* in 2005 (Downes 2005). Since then, the ideas have spread wide and far in the E-learning community. The EU is financing a number of large projects centered around the concepts of E-learning and Web 2.0, e.g. OLCOS[1], BAZAR[2], or iCamp[3]. There is a revolution imminent in E-learning 2.0 that is often ignored. It is best characterized by Antonio Fumero: *It's not about matching traditional models with existing tools anymore; It's about developing a brand-new pedagogical model and implementing the Next generation Web environment upon it.* (Fumero 2006).

In recent years we conducted a number of projects to change the situation in mass teaching (eg. (Baumann, Purgathofer 2003) (Pohl, Purgathofer 1994) (Pohl et al. 2005) (Purgathofer 2005) (Purgathofer 2004)). We learned a lot

[1] OLCOS, http://www.olcos.org/english/about/
[2] BAZAAR, http://project.bazaar.org/about/
[3] iCamp, http://www.icamp-project.org/

from these projects, and partially the results are still in use. As an example, since more than ten terms we use weblogs as the primary communication infrastructure in mass teaching (Purgathofer 2005). While this works well for administrative and organisational details of a course, so far it failed to become a platform for meaningful discourse about the content of the courses, given the high number of participants. All our attempts to use the aforementioned infrastructure to discuss aspects of the content have failed.

The project described in this article builds on the findings of the projects mentioned above. Our main focus is to understand how the techno-social trend subsumed unter the term *web 2.0* could be exploited to change learning. The term *web 2.0*, coined and shaped by Tim O'Reilly (O'Reilly 2005), designates a class of internet applications developed in the last couple of years. Such applications often offer participative, collaborative, open and emergent services. Their virtues frequently only take effect when a very large number of people participate. Also designated the *read/write* web, *web 2.0* enables and asks participation from it's users in an intensity that was unusual before.

The typical examples of the web 2.0 phenomenon are del.icio.us, flickr.com and digg.com. With all these applications, the large number of people using it produces a *massive on-line collaboration* effect that makes possible new forms of use, interaction and communication. This is one of the reasons why such applications are also called *social software*. Tim O'Reilly describes this effect as *Software that gets better the more people use it* (O'Reilly 2005).

It is easy to see – and central to the project described here – that coming generations of students will have unprecedented literacy in these new forms of communication. For them, internet is more or less constantly present, and e-mail, chat and internet telephony as well as social software and weblogs are natural elements of their daily life, their self-realization and their communication. In our project, we try to incorporate the expected – and already noticeable – media literacy of new students to overcome the problems of mass teaching. The name of the project - *SlideCasting 2.0* - comes from a combination of the technology of *SlideCasting*, coined by Matthew Langham [12], and the massively collaborative approach of *web 2.0*.

Project Vision

Starting point for SlideCasting 2.0 is the difficult situation in mass lectures, where a teacher speaks in front of a large number of students, using a notebook and a projector. Often the slides are not available for the students in a format that permits electronic annotations during the lecture. This is partially a problem of technology; there are no suitable formats that allow synchronous commenting with the required ease of use. Also, it is often an organizational problem, because the slides are not ready to be offered for download long enough before the lecture. Finally, some speakers can explain with good reason why they don't want their slides to be available before the talk.

As a consequence, lecture notes are often done in a way that introduces a number of problems. Such lecture notes are quite personal, and thus cannot be shared in a meaningful way. Quite frequently they are organized badly, they cannot be searched electronically, and they are detached from the actual slides. Finally, while these notes would be an interesting feedback, teachers seldom have access to them.

The goal of this project is to radically change the situation described. With the help of the system as described here, it would be possible to

- write lecture notes jointly,
- organize the notes by tying them to the slides in real time,
- work on these notes collaboratively after the lecture and thus intensify the collective interaction with the course content,
- enhance and structure collaborative learning with the help and along the structure of the shared lecture notes,
- facilitate a structured communication with the teacher about the content of the course,
- give the students a possibility to add to the content of the course in the form of up-to-date findings, examples or targeted questions.

It is important to note that we do not plan to change the, often well-executed, form of the lecture itself. The live presentation of content by the teacher will still be the center of the mass lecture, and all existing forms of communication - questions asked by students during the lecture, discussions after the lecture, etc. - will remain untouched. While it is unfortunate that the context of mass teaching makes other more efficient forms of teaching impossible,

we can try to change the way students can interact with the content of the course. The suggested platform tries to induce new forms of communication that were hitherto more or less impossible in mass teaching.
The organizational core of the system is formed by SlideCasts - recorded sequences of presentation slides from the lecture. SlideCasts are organized by time and events (every slide change is marked in the time stream) and form organizational structure for all further content added during or after the lecture.
The SlideCast is produced live during the lecture, while the teacher is talking, so that unforeseen changes (eg. a slide being skipped) will be part of it. Dedicated software on the computer of the speaker records the succession of slides used in the presentation and enriches this recording with meta-information (e.g. time and duration). It is to be possible for the speaker to define further structuring information in the preparation, e.g. chapter and section beginnings, grouping of several slides into atomic content structures like a train of thought, an argument, an example, a fact. This enriched stream is then pushed to the client software on the notebooks of students who are present and online during the lecture (see Fig. 1)

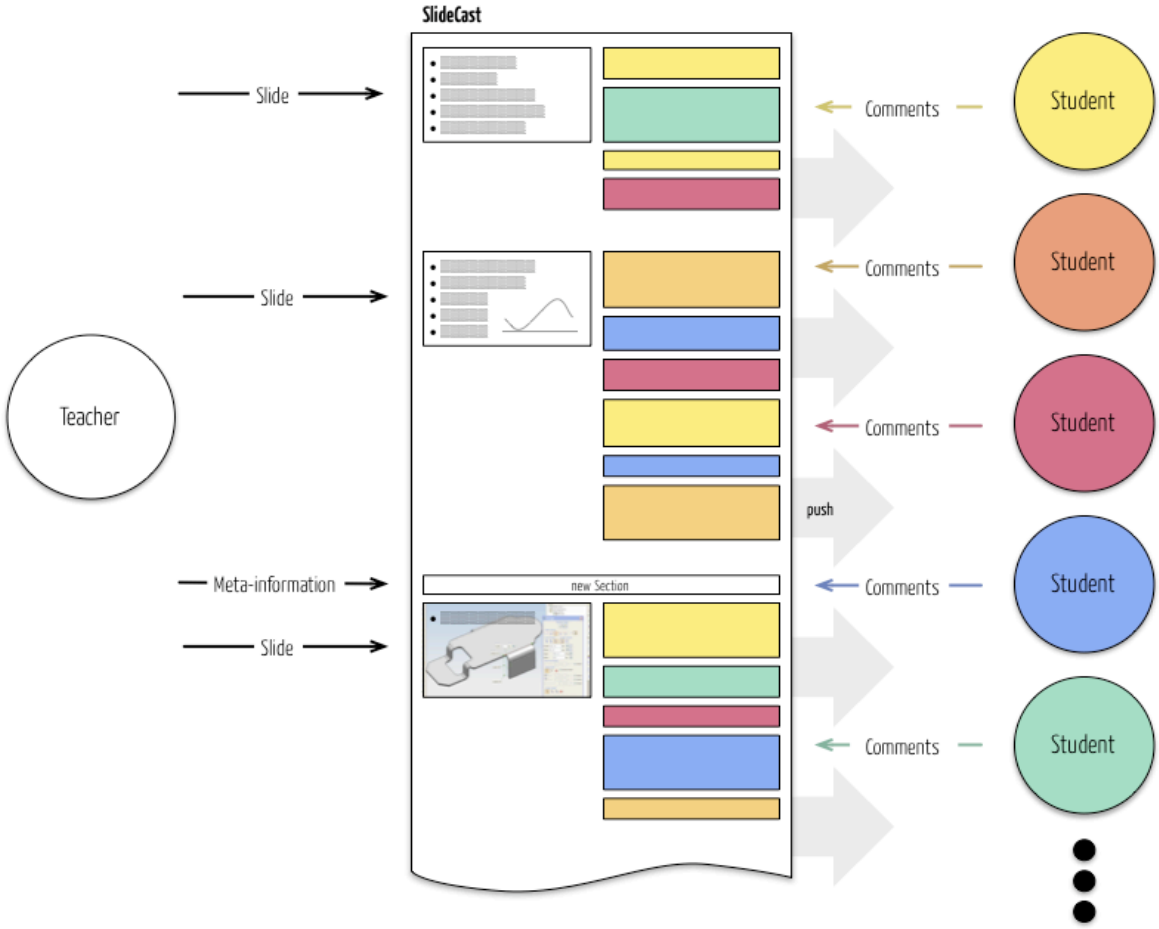

Figure 1: SlideCast during a lecture. Slides and Meta-information (*new section* in this example) are generated on the computer of the teacher. The students add comments.

During the lecture, these students can add comments to the Slidecast. Such annotations are associated with a specific point in time in the SlideCast. All students can see the comments made by other students in real time, i.e. in the moment they are submitted. Obviously, this only works for students that have notebooks which are online, and that have the SlideCasting software installed. But the annotating of SlideCasts shall not replace the communication between speaker and students; it only lays the foundation for an enhanced discourse beyond the lecture itself.
This possibility for live annotations gives the students a chance to adopt the SlideCast and make it their own. Enriched by annotations, the SlideCast is more than just a download of the slides; it is a stream of information, partially

from the teacher, partially from colleagues. To read through a SlideCast means to confront yourself not only with the Visuals you already saw, but also with the notes you or your colleagues have added to these visuals.
After the lecture is over, the SlideCast with all the added annotations becomes accessible to every student via internet. The SlideCast can then be structured in chapters, sections and content-*atoms* by the teacher(s) and/or the students. Students can read, edit, add, rate and delete annotations. The principal character of this system is that of a Wiki, where everyone can change or delete everything (limited by a couple of necessary punctual restraints), knowing that every change is recorded and every back-version is accessible.

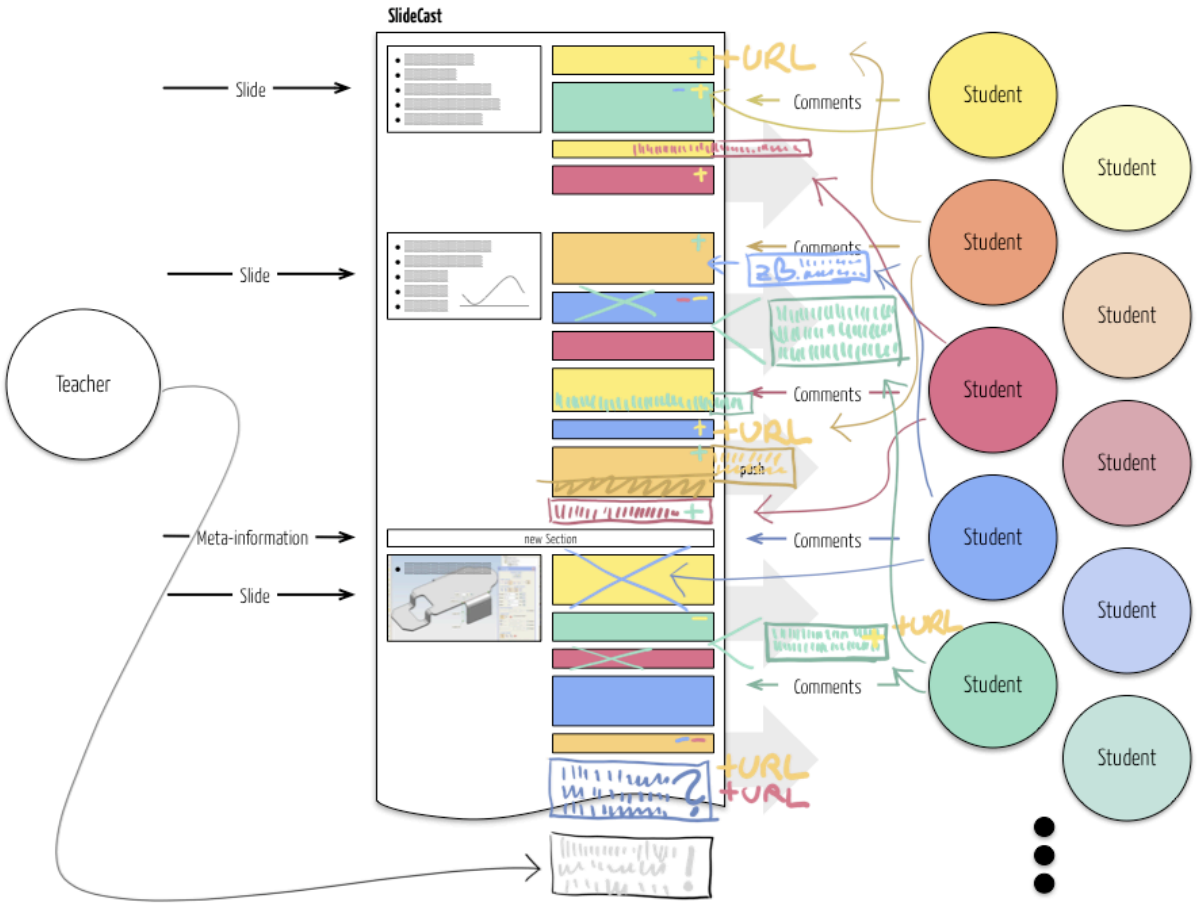

Figure 2: Enhanced SlideCast. Students use the structured SlideCast with annotation defined during the lecture as the foundation for a debate centered around the content of the course. Also, more students have access to the SlideCast than during the lecture.

Once the SlideCast is available after the lecture, it is possible to add different types of annotations, e.g. internet links, questions, notes, case examples, tags and/or keywords, discussion forums, commentated cross connections pointing into this or other SlideCasts, exercises, change proposals etc. (see Figure 2). Thus, the SlideCast becomes the backbone of a structured and, depending on the needs, self-organized or moderated discourse over the content of the course. Additionally, possibilities to rank or highlight annotations can be offered, so that the large number of participants would generate meaningful meta-information.
To support the communication among students while working with the offline SlideCast system, it is planned to integrate a web-based chat client. This form of online communication is taken for granted by students (at least for our students), just like internet telephony. We have found instances where protocols of chat sessions from students

learning in distributed groups are published for other students as a means of learning. Such protocols typically contain a large number of practical information regarding the content of the course, such as (more or less) good answers to common questions that arise while studying the supplied material. By the purposeful restriction of the supplied chat to within "earshot" of the respective work context (e.g. visibility of chat contributions only within the range of the respective content atom) the otherwise very arbitrary communication can be focused. Such constraints are of course critical to focus the discourse, but also presumptuous in the sense that students are quite accustomed to the use of such tools, with a clear choice of channels they prefer. If we want them to use the tools offered by the system, there has to be a clearly identifiably benefit for them.
Beyond the access through the dedicated Slidecast 2.0 platform, other communication channels will be offered. Tomorrow's students, media literate as they are, will naturally assume access to information via RSS-feeds and even XML-RPC interfaces (in the case of informatics students, at least). By offering such possibilities, a multitude of usage scenarios can be supported. Teachers could have the possibility to selectively engage, according to their conceptions and needs. As an example, all new annotations of type question can be listed and answered, without further need to dig through the whole bulk of annotations. Through suitable filter mechanisms, it will be possible to pick e.g. intensive discussions, particularly high rated contributions, commented internet links or proposals for change from the large mass of annotations and react without becoming too involved. The necessity to economize attention and time in online communication by the teacher is all too well understood by the author. The system will help the teacher communicate efficiently.
The system described will also become a new source of feedback for the teacher about her lectures, since she will be able to read the collective understanding of her lecture by monitoring the collaborative process of SlideCast enhancing. Comprehension problems will be immediately visible and can be acted on immediately. Also, the material added to the SlideCast (internet links, comments, change requests) can be considered and integrated into the course.

Explorative Implementation

Following the train of thoughts of Web 2.0 software development as eg. described in 37signals "Getting Real" (37signals 2006), the project was started as a series of quickly set up experiments using existing technologies. The goal of these experiments was to see whether the proposed infrastructure would make sense in the context of lectures. The lecture used for these experiments was a course in the first semester of the "Informatics" program at the Vienna University of Technology. The lecture is mandatory for all undergraduate students, resulting in approximately 750 participants.

Experiment 1: twitter

In this first experiment we wanted to find out how many students would be interested to participate in such a system, and which kind of comments they would contribute. We registered a twitter-account[1] that was to be used by all participants. Since twitter-messages are time-stamped, we anticipated to be able to relate each comment to the slide it was referring to. Additionally, we suggested that the students could add a reference to the slide in question using a simple syntax. Comments that were meant to be questions could also be tagged as such by using a question mark as the first character in the message.

Around 100 of the 600 attendants brought their notebook and participated at least partially during the lecture. We found that while people posted some interesting comments and questions, most of the posts related to topics that were not part of the lecture. One popular category of tweets concerned the charge left in the notebook batteries. Also, the idea that we could match comments with slides by using the time stamps and subtracting a couple of seconds for typing turned out to be impossible. Finally, twitter turned out to not be up to the task; at the worst times, the

[1] http://twitter.com

interval between hitting the "update"-button on the twitter-page and the page reload was around 30 seconds, during which one could not post a comment.

Experiment 2: irc

Following the suggestions of students who liked the concept but disliked twitter, we set up an irc channel during the lecture and invited everybody to join this channel. Following our initial concept, everybody was able to see all the messages typed by others, only in real time. Again, we introduced a simple syntax to mark comments and questions within a stream of communication expected to rotate around life, the universe and everything.

Performance-wise irc was able to keep up with the demand. Participants produced a 600 kB text file during the two-hour lecture. Unfortunately, while participation was up, pertinence was down: there were only two relevant comments marked as such in 600kB text produced during a two-hour lecture. It was clear that online communication was a lure, a distraction from thinking along during the lecture.

Experiment 3: comment drop box

Using the ruby on rails framework, we implemented a simple web page that allowed students to write comments during the lecture without being able to read the comments written by others. Using a simple synchronization mechanism, we were able to "push" a new text field onto the commenter's page whenever the presenter advanced to the next slide. Thus, students were obliged to identify the slide they wanted to comment on. The web page showed a couple of text fields for the last couple of slides, identified by a short textual description of the slides. Also, the updating process stopped whenever one would start writing a comment, only to catch up at the actual slide after the comment is submitted. The system did not require registration or signing in and thus was completely anonymous.

Using this black box system, the relevance of submitted comments was much better than in any previous experiment. The first lecture to use the new system consisted of 49 slides and yielded 85 comments, most of which were relevant to the content or referenced to things the presenter said during the lecture. Some of the comments had the character of lecture notes, but many posts contributed student's knowledge or experience, examples, links, criticism or addendums. One commenter posted a recommendation for a talk a couple of days later about one particular topic that was discussed in the lecture. All in all, we were overwhelmed by the relevance of the comments. A second experiment in a later lecture of the same course yielded 93 comments, again within a two-hour lecture.

It has to be mentioned that again around 100 students had brought their notebooks; with 85 comments to the lecture, that amounts to more or less one comment per participant. We see this as a clear success in our effort to tap into the "wisdom of the crowds".

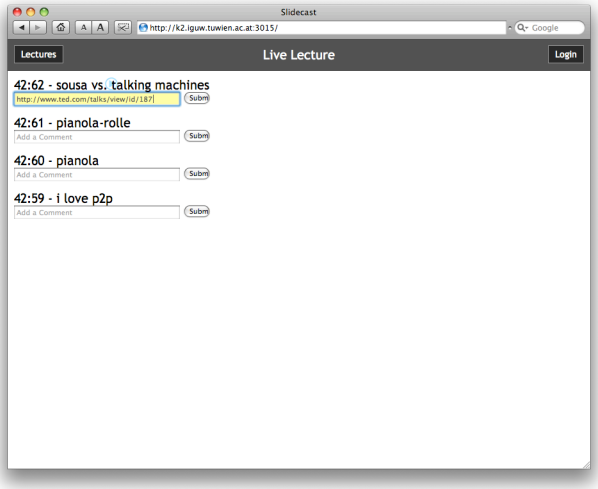

Figure 3: Screenshot of the commenter's page during a lecture. The presenter has just switched to slide 62, and the student has started to type a comment.

Although we offered an opportunity to edit and rate the comments (as anonymously as they were posted) after the lecture, only few students took the opportunity to change anything. One reason for this might be that it was unclear what the benefit was of editing or rating existing comments or adding new comments after the lecture. While the same could be said about the situation during the lecture, apparently the fact that it offered something useful to do with the notebook during the lecture was motivation enough to share.

Still, it has to be noted that the system in its current form is more useful to the presenter than to the students. It seems that the presenters were able to profit most from the fact that students contributed to the lecture. One obvious way to resolve this deficit would be to introduce an incentive system, eg. rewards for good work in the offline slidecast.

Outlook

Based on the insight from our experiments so far, we plan to develop the system along the concepts described in the following.

One direction would be to emphasize the aspects of the system that could make the system into a "personal learning environment" (PLE). SlideCasting 2.0 could evolve into a system where students manage information, insights and knowledge in the domain of the lecture. It would eg. be possible to distinguish between public and private annotations; a rating system could help find good public annotations and incorporate them into the personal space. Furthermore, it would be an interesting question to see whether such a system could be used for courses that don't use it during the lecture. Students could import material from such lectures into the system in order to collaboratively and/or individually work on them.

A different - but not necessarily exclusive - development direction would be to concentrate on the collective dimension of SlideCasting 2.0. Obviously, we need wiki-like versioning for the comments to enable students to work on all comments without fear to destroy somebody else's work. Beyond that, it would be interesting to delve into questions like: How can we interest people and motivate them to contribute? How can we implement incentive systems to encourage students, such as a slashdot-like karma system? There is a lot of research in this area which waits to be tapped into. Also, could such a system potentially contribute to the assessment of students?

A third route would be to try and find ways for students to earn something (points, karma, credits, respect, etc.) for contributing to the lecture. What if a student finds a particular visualization unsuitable, unreadable or ugly, and makes a better one. Could he upload it, place it within the lecture and let people discuss, revise and rate it? What if a student thinks that, at a certain point in the lecture, an example would really help understanding? What if she wants to suggest a different flow of the slides, eg. bottom-up instead of top-down. Could the system let the students submit their changes in a suitable form, for discussion and review and - ultimately - collaborative learning about the lecture's content?

These are only three of the numerous possible directions for the further evolution of Slidecasting 2.0. In order to constantly discuss and evolve these ideas, we communicate them openly on the internet using a weblog[1].

Conclusions

One core property of the system is that it becomes more valuable as more students participate. That means that we can transcend the main source of problems in mass teachings - the number of participants - and turn it into an asset. It then would represent a platform for massive collaborative learning. The system does not so much focus on individually supporting each student, but helps them to organize into a community of learners acting in concert because of their shared interests and shared goals. This would also constitute the core motivation for students to take part in this mostly self-organized process.

The described system opens a new space for discourse about the content in mass lectures. The open, collaborative nature of this platform helps reducing redundancy; communicating with the system is also communicating with every student. Thus, the system refrains from competing with existing and established channels of communication.

The project described in this article does not try to change the situation of the mass lecture itself. It opens a space that can generate new forms of discourse adjusted to the literacy and needs of a new generation of students. The system is in it's very core more about communication than about the transfer of knowledge, and it let's the student use their existing media and communication competencies in a new process of collaborative learning.

In an article about laptop use in classroom, Lindroth notes: "The question is not, as I see it, if one should ban laptops from lectures, or cure the student from inappropriate behavior but rather how one can foster a positive utilization of the laptops from an organizational point of view" (Lindroth 2007). We believe that the system described in this paper shows new ways to find applications and pedagogical models that allow for a constructive use of laptops during lectures. We understand our work as first steps toward bringing the lecture into the 21st century, finally making it compatible with the ways we think and understand.

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