



**AALBORG UNIVERSITY**  
DENMARK

**Aalborg Universitet**

## **Flipped and blended classroom approaches at AAU**

*Theory, cases and toolbox*

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Theory,  
cases  
and toolbox

# FLIPPED AND BLENDED CLASSROOM APPROACHES AT AAU

Kathrin Otrell-Cass, Dorina Gnaur, Hans Hüttel, Nicolai Steinø, Anna Major  
together with Kjeld Nielsen, Evamaria Petersen and Thomas Bøgholm



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# Summary

This project documents and illustrates six examples of blended learning (BL) and flipped classroom (FC) pedagogy at Aalborg University. BL involves typically the blending of face-to-face and virtual elements while in FC the learning design changes the classical time spent between teachers and students in and outside of class. For example in FC, lectures or instructional podcasts may be moved online to be viewed before class, while classroom time is dedicated to learning activities that require students to engage with the concepts at a higher level. The teacher's role 'flips' to become more interactive and provide answers to contextual and applied questions, give feedback, and prompt reflections of key ideas. Research evidence shows that such approaches increase levels of problem solving structure and practice but also indicates that students may at first be skeptical of such approaches. This project explored six selected examples to inspire university teachers across the faculties to apply BL and FC approaches to their teaching. Each case is contextualised in the PBL environment at AAU and presents three distinct outputs: Background/theory, a document that explains the setting of the case, the particular challenge and the innovations together with the pedagogical and didactical reasoning for the BL or FC approach used in the example. Next, each case includes a video on practice: a podcast where the 'case owner' shares the details on what was done and how the teaching innovation was implemented. Finally, each case presents a 'how-to' guide on selected tools, where step-by-step instructions are provided that include images plus text instructions, guide how to utilise and apply specific IT tools. The six cases present different scenarios including: the integration of student produced videos; how to turn existing presentation slides into podcasts, pencasts to model thinking on computability and complexity theory; the use of Google+ for interactive teaching and learning; pencasting to support objected-oriented programming; and flipped classroom teaching through the integration of video podcasts in change management, language and international business communication. We found that each case represents a unique application of technological knowledge that is fused with a teacher's pedagogical content knowledge. The process of teachers reflecting on the specific needs they want to address in their teaching is key to transforming their practices and innovating their teaching through technological applications.

# 1<sup>st</sup> Case: Blended learning with student produced videos

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**Teacher:** Associate Professor Evamaria Petersen  
**Course:** Organisk kemi og mikrobiologi

## Background and Theory

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This teaching intervention took place in a course on the third semester in a bachelor programme on organic chemistry and microbiology. In this specific course, the focus is on organic chemistry. The overall learning goal for the students is to understand chemical reactions and related mechanisms and to develop the competencies to apply their knowledge to new related problems.

The course includes a total of 10 lectures, each of them two hours followed by two hours of related exercises. Previously, the course included one test exam at the end of the 10 lectures that was not part of the assessment and one written exam at the end of the semester.

The challenge in this course was that the students seemed to forget what they had learned at the start and did not seem to spend enough time on studying and practising this subject outside the face-to-face classroom time with their teacher.

The idea was therefore to find new ways of strengthening the students' development of their problem-solving skills in organic chemistry.

In response to this challenge the course was significantly changed:

Students were assigned to do individual and group assignments. For their individual assignments students had to produce short video podcasts that were between 3 and 10 minutes, where they had to explain difficult concepts and show how they would work through chemical reactions. The new format included two individual assignments, one each week. The first assignment was a simple reaction, to test the knowledge and the second assignment was a multiple step reaction where the students were asked to test their ability to apply knowledge. These individual video assignments were assessed by the teacher and students received individual feedback via email. This activity was followed up with an overall feedback session on those assignments back in class. In addition, the course was also supported with selected videos from the Internet that explained chemical concepts. The videos the students recorded were uploaded to Moodle. However, since the recordings the students produced were at times of considerable quality and size, it was decided to set up a dedicated YouTube channel for this course.

Since it couldn't be assumed that all students knew how to record videos and upload them they received instructions for making videos through an instructional video produced by the Video Research Lab Aalborg (VILA).

Out of class group assignments had the aim to strengthen the learning processes within each group. One group had to find a reaction in the literature and a second group was asked to solve the reaction and explain the mechanism via email to the first group who had to provide feedback. Finally, this

assignment was assessed by the teacher and feedback was given to each group. The teacher assigned roles of the groups in a rotating system. This arrangement meant that there were number of ongoing activities assigned to individuals or groups saw that students were active throughout the entire semester.

Before this teaching innovation, out of class activities were not defined specifically and there was only one written exam at the end of the semester. In the new format, out of class activities consisted of 40% individual assignments and 10% group assignments. Students still had to attend the written exam that made up 50% of the assessment score.

For the teacher, it was very insightful to watch the student videos since it was possible to hear how students developed their scientific language which is typically connected to a deeper understanding of concepts. Being able to listen to students' formulations the teacher was able to identify when key language was not used correctly. Listening to the students' explanations in the videos gave a lot of insight into their individual understanding and allowed for a very close inspection of student knowledge.

The result of this intervention was that prior to the intervention (between the years of 2007 and 2015) this course had a relatively high failure rate but since the implementation of the blended format in 2017 this failure rate was dramatically reduced.

Feedback from the students about the changes to the course was very positive. They felt engaged through the various activities including their own podcasts and said that they could feel the progress in the learning process.

In conclusion, the approach used here seemed to work very well to activate students, the students were able to follow their own learning much better. Student produced videos were a good strategy to identify problematic issues that needed to be discussed in class again, especially since the teacher could listen to the students talking through chemical processes in our own words. Student produced videos and those identified as additional resources from the Internet are suspected to be a resource in the preparation for the exam. While the first-time preparation of such an intervention is very time-consuming a reduction in preparatory work follows in subsequent teaching years. Since this innovation was implemented in a mid-sized class the workload of listening and responding to students' materials was doable for the teacher however for courses with higher numbers of students it is suggested to use peer reviewing between students or perhaps to include postgraduate students (PhDs) to assist with the review and feedback as a more economical option.

## **Theoretical underpinnings on selected key concepts from this intervention**

### **Why use technology enhanced learning (TEL) approaches in chemistry?**

Technology-enhanced learning (TEL) has fast gained momentum in educational institutions all over the world (Fun Man, 2016). Since organic chemistry concepts are reported to be often challenging for students, University chemistry teachers explore increasingly the flipped classroom (FC) approaches and how it can support the learning of abstract concepts. Through the access to the Internet teachers make use of visual products that can become valuable resources for students since they support different learning styles. The use of video materials typically do not replace but rather supplement classroom teaching, offering students a higher degree of flexibility to review learning materials at their own pace and as many times as necessary. Research reports also that students often have a hard time relating their laboratory class observations to the concepts they are being introduced to during

their course work. Video material that supports conceptual learning achieve this by graphically organising multimedia (Turkoguz, 2012). Having more time in class for discussion and questions is seen as a valuable, flexible, and cost-effective way to improve students' mastery of chemistry problem solving. Research also highlights that students are in general very positive and find that video support for problem-solving is helpful to support their study (He, Swenson & Lents, 2012). Using different kinds of technologies including videos or social media supports student's self-confidence during laboratory activities, and can increase students' interest towards the study material (Turkoguz, 2012).

## Student produced videos/podcasts in chemistry education

Smith (2014) presented a study in chemistry education where students were asked to produce their own videos. The group of students was compared with a group who were asked to solve the same learning task by writing an article. The author reported that the group producing the videos felt more enthusiastic about their challenge. The author found that in the video group students were not passive but thought in creative ways on how to create content. Students reportedly went to great lengths to enhance their videos for instance by using stop-motion animation, or they drew their cartoons, in order to augment their videos with humour, demonstrating their enthusiasm, and providing insights into technical details. This approach contributed also to students' improving their communication skills, creative thinking, and ability to apply and evaluate chemical concepts in context, thus supporting higher level thinking skills according to Bloom's taxonomy. Box et al. (2017) support those findings in their study and found when student-generated videos were used as a supplement to the instructions of a teaching assistant in an undergraduate organic chemistry laboratory covering (experimental technique, use of instrumentation, and calculations), they improved lab preparedness and learning outcomes. When asked, students explained that on reflection they found the videos to be valuable when completing the lab activities, while the skill acquisition of producing a video was generally ranked as most helpful compared to other skills. Developing broader skills sets through TEL was also echoed in a study by McClean, McCartan, Meskin, Gorges and Hagan, (2016) about the production and sharing of short student-generated video documentaries on laboratory experiments. They found that these activities had also social function at the micro group level, engaged students more strongly and was a reflective activity to both inform current understanding and future work. Students were also able to develop their digital skills in creating and sharing video learning materials that were also seen as possible resources for future students.

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# Talking about Practice

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## BLENDING LEARNING WITH STUDENT PRODUCED VIDEOS



Available at: <https://www.youtube.com/watch?v=7ycTXXn4sI4>

Watch this video where Associate Professor Evamaria Petersen talks about her experience of blending her teaching through student produced videos to address the issue of a high failure rate in an organic chemistry course.

# Tools to implement this innovation

## How to use a video that has been recorded on a smartphone

These instructions are based on you setting up your own YouTube channel. It allows you to upload videos of different length and quality. From there you can either create link to the videos in Moodle or download the videos on your own computer to the upload directly where ever you need them. Videos recorded on smartphones can be of considerable size. The student produced videos in our example were uploaded to a YouTube channel.

### Moving videos from an Android phone

1. Open your camera on your Android phone.

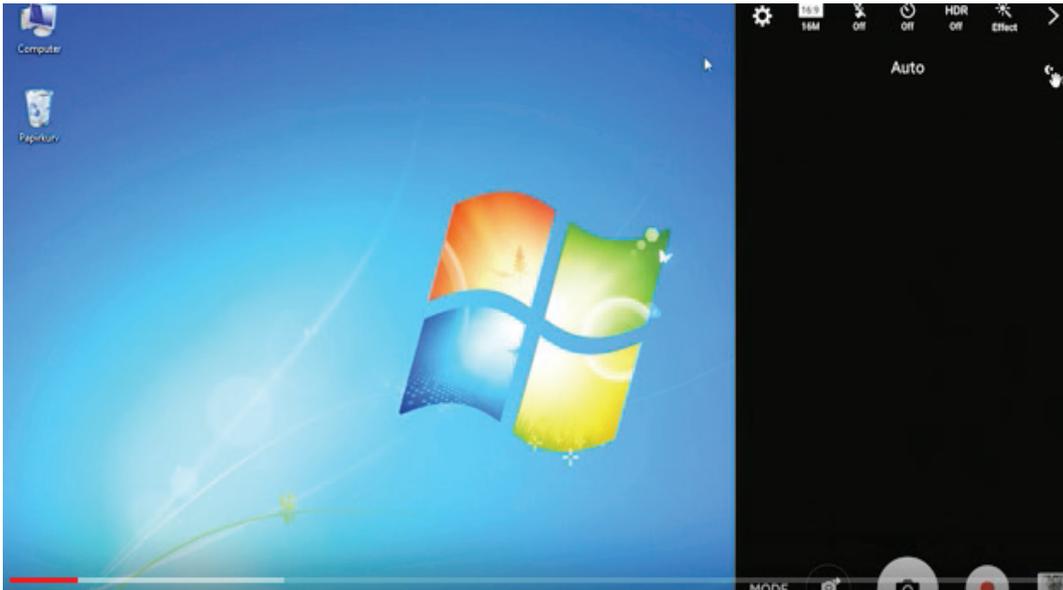


Figure 1

2. Locate the video just recorded, as shown on Figure 2, below.

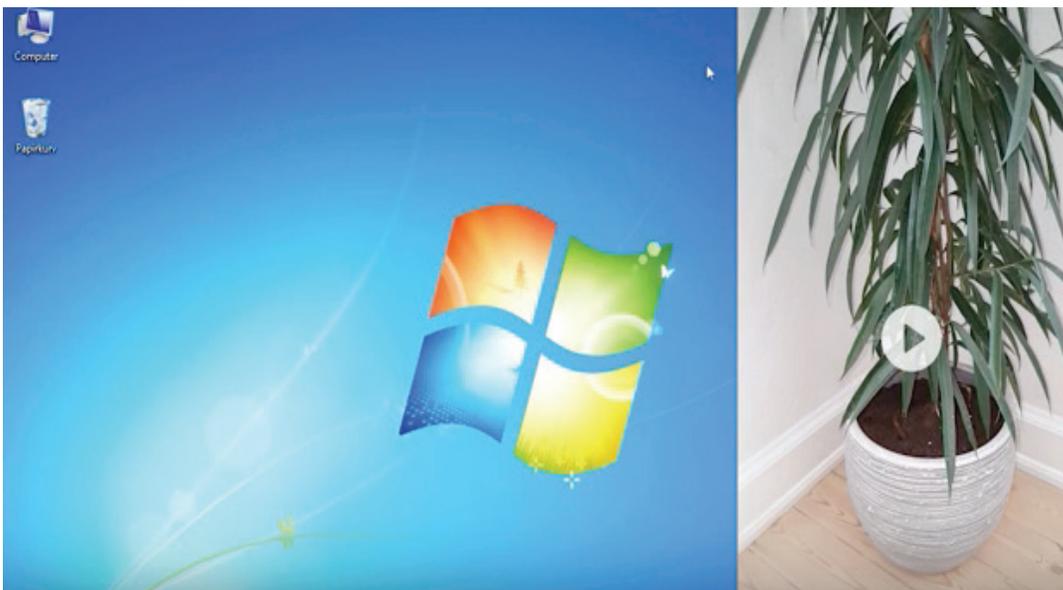


Figure 2

3. Click on download to YouTube option. Here you give your video a title, maybe a short description and choose the privacy setting, as shown in Figures 3 and 4.

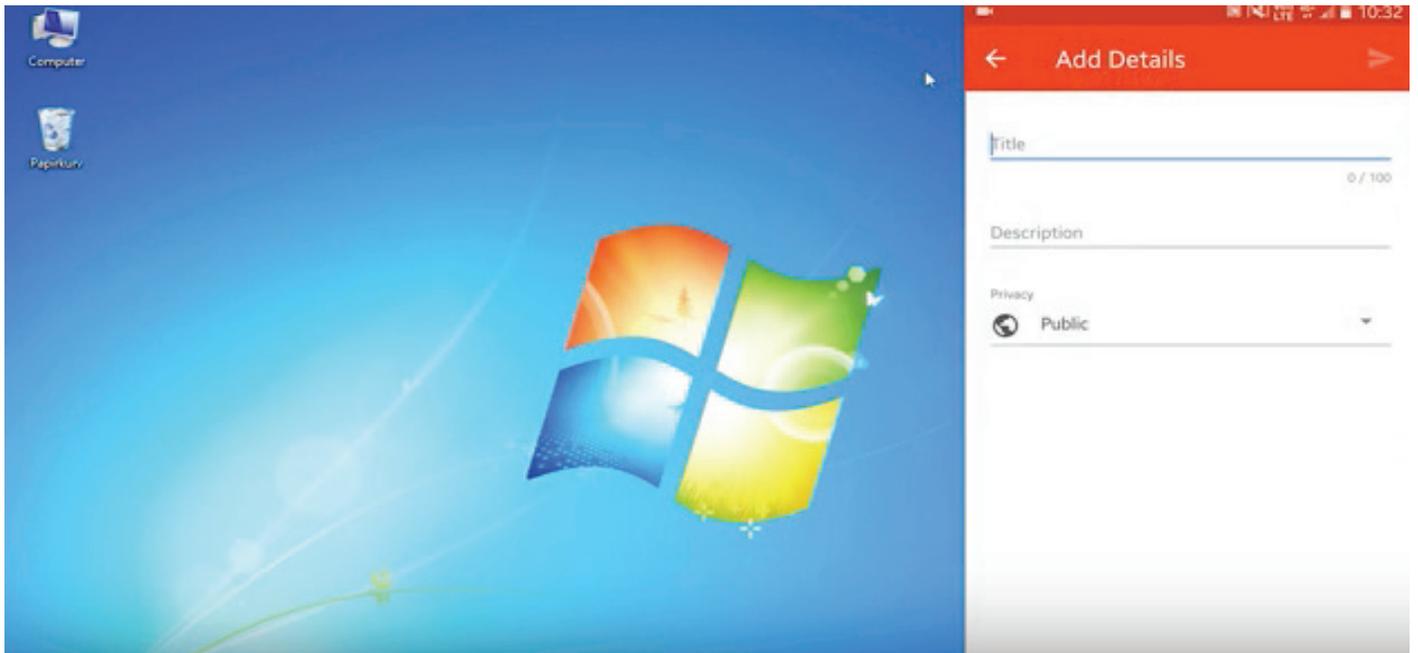


Figure 3

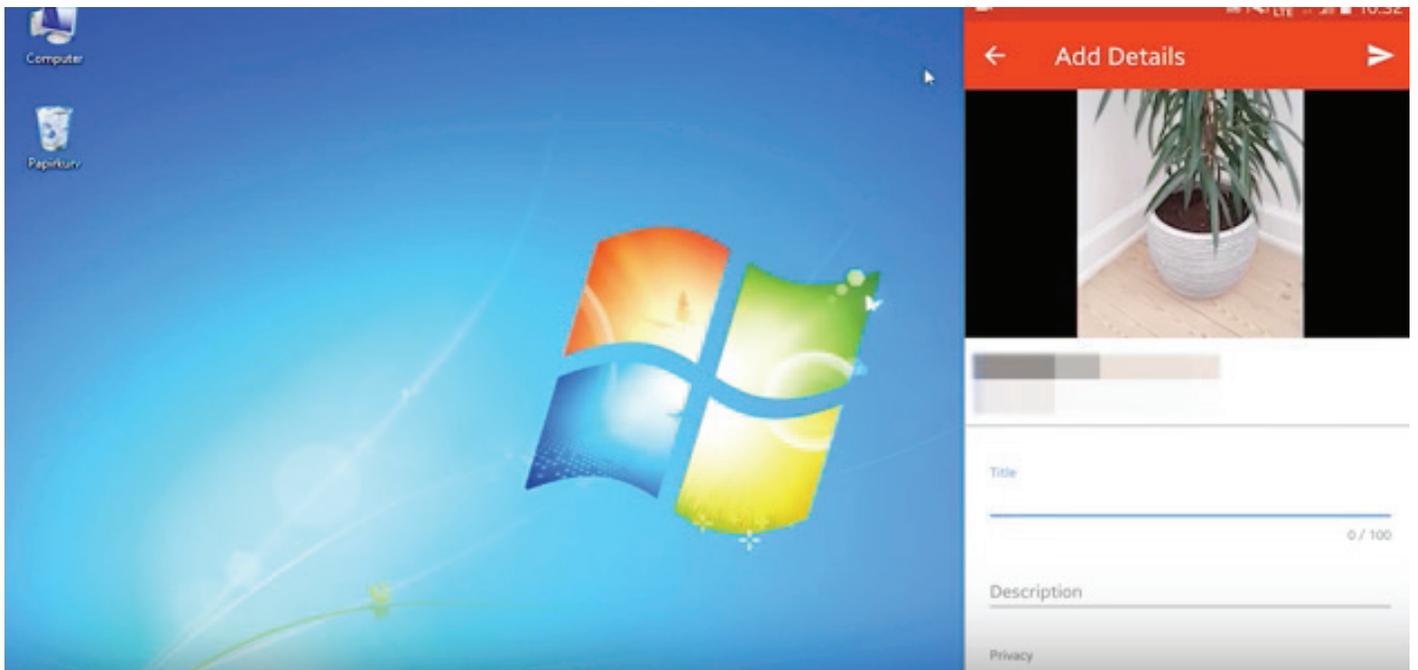


Figure 4

## Moving videos from an iPhone

1. Open the camera on your iPhone

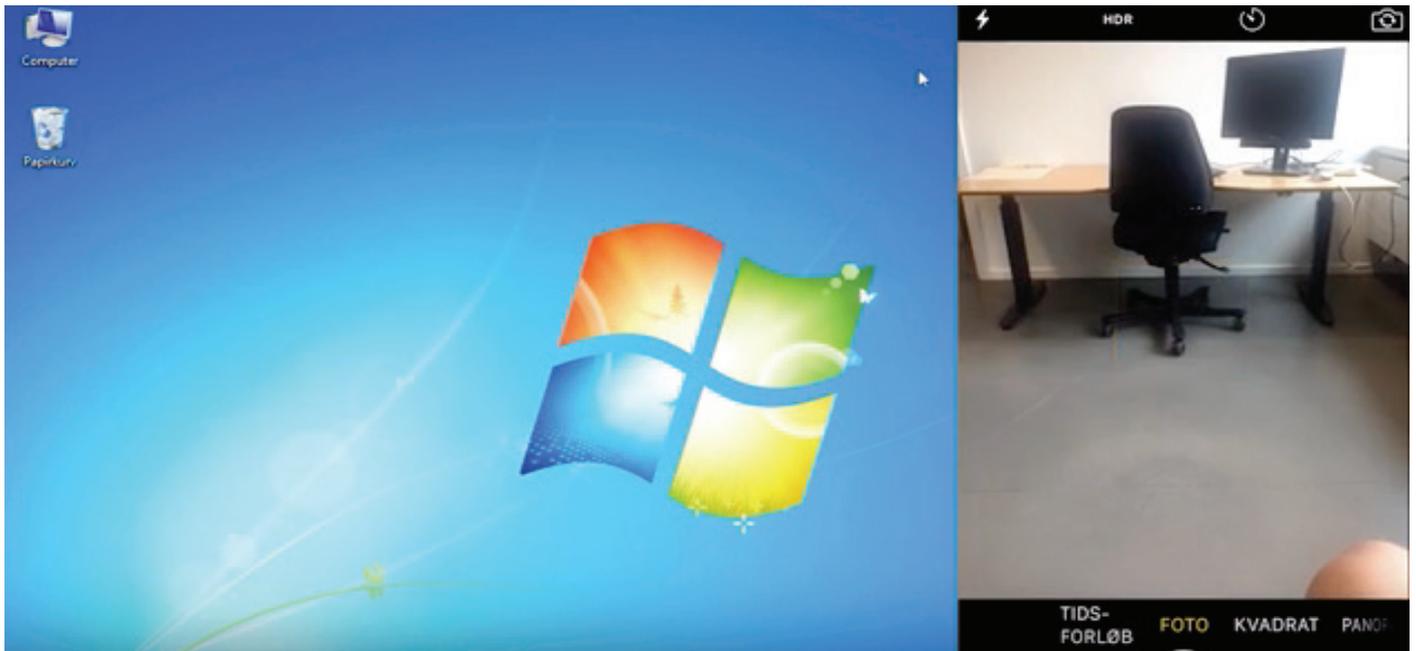


Figure 5

2. Select the video you want to download and click below in the sharing options on YouTube.

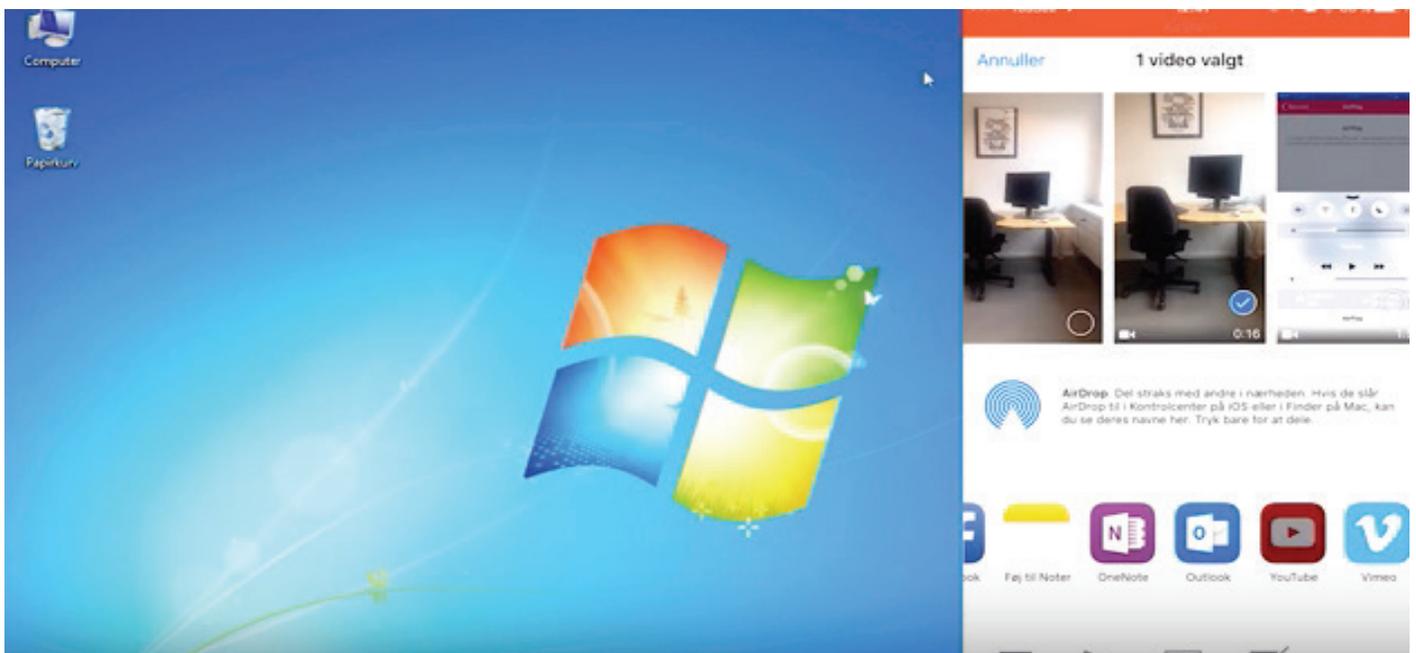


Figure 6

3. Give your video in YouTube a name and set the privacy restrictions.

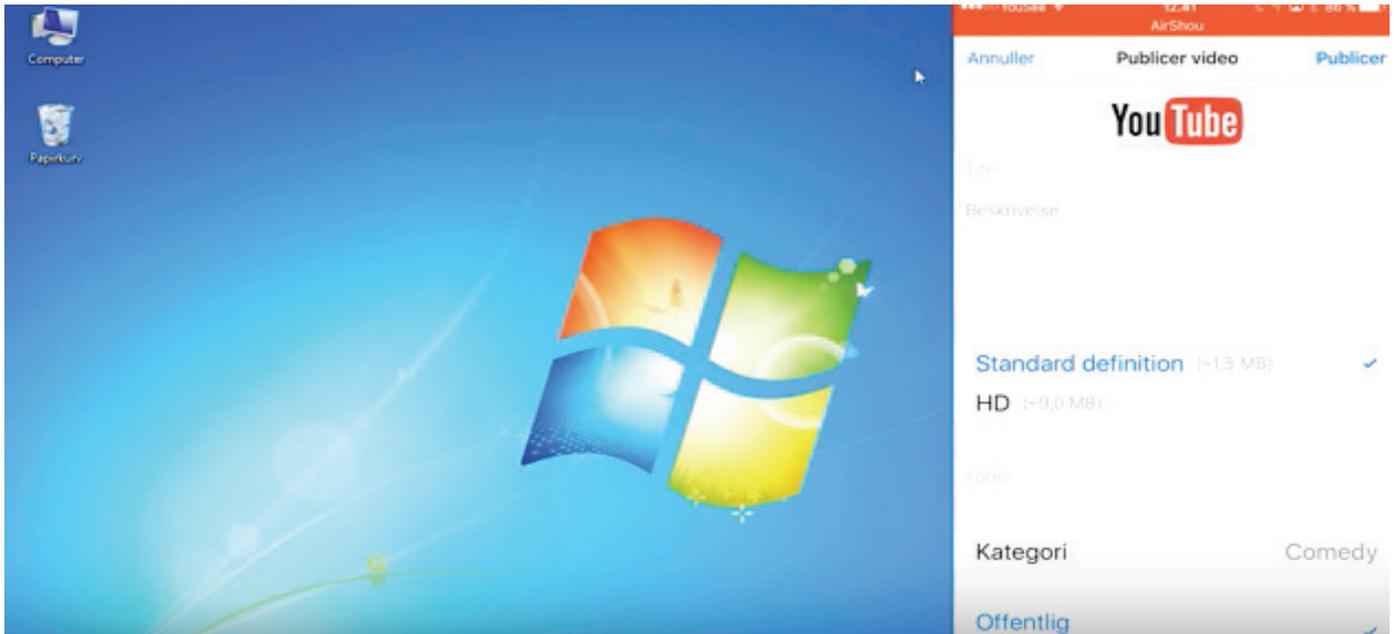


Figure 7

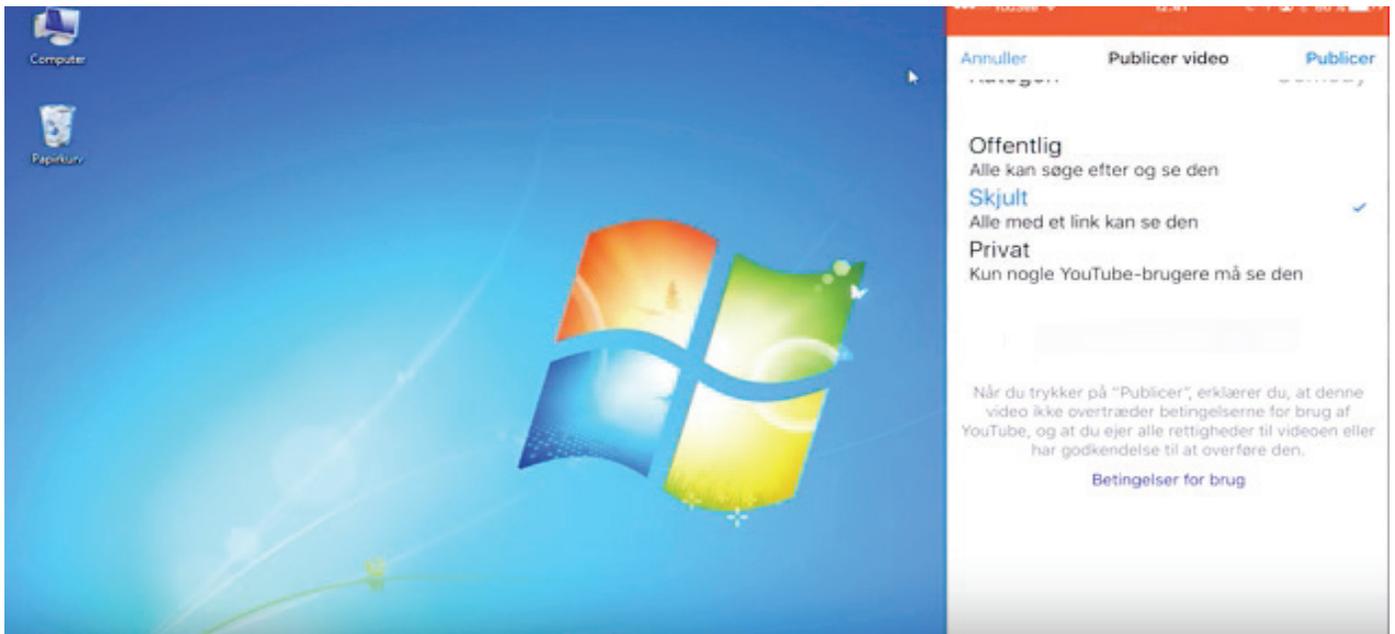


Figure 8

To download the videos from YouTube – just go to YouTube, click on my channel to download the video or get a link for sharing the video.

# 2<sup>nd</sup> Case: In-class knowledge construction through selective podcasting

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**Teacher:** Associate Professor Kjeld Nielsen

**Courses:** Podcasts for at least four different educational programmes (VS, CTPP, VT, MOE) bachelor and master

## Background and Theory

The interest into how to produce different types of podcasts and utilize them systematically in support of teaching was fourfold:

- Interest in new teaching tools that could enhance traditional teaching formats.
- Addressing different learning styles, since some students benefit from going back to key information
- Spending more time actively in class engaging with the students
- Teaching resources that could be utilized for more than one course

Since learning is a social process and learning at a PBL-based University is also based on the benefits of working face to face with the diversity that a group brings, it was important to consider how podcasting could support in class learning, including communication, collaboration, the construction processes of learning through social feedback.

Podcasts were used to introduce key ideas in preparation of a class or a topic, both before class but also during class.

Podcast activities were combined with short Kahoot quizzes that tested what was presented in the podcast to make the podcast watching even more purposeful.

The preparation of the podcasts allowed for punctuated reviewing of existing teaching materials as well as teaching approaches using PowerPoint. Existing slide material was now used to primarily illustrate points and key concepts.

This approach has resulted overall in a much more active teaching approach when teacher and students come together. Podcasts are now produced in an effort to build a library of key concepts that can be used for various classes and courses.

The students really liked the approach of supplementing the teaching with short and concise podcasts.

The technology that was used to produce video podcasts was an extension to the Microsoft PowerPoint suite that allows for recording (note: this works for PC only!!) and Microsoft stream that allows them to share videos with students (see also: <https://tinyurl.com/ycxxtkex>)

The podcasts that were produced were based on existing PowerPoint material and fine-tuned. Specifically, that meant less text and utilizing the interactive features, for example using drawings on the slide to put more emphasis on points that were discussed.

This process also meant that existing PowerPoint material had to be 'updated' to be used as a podcast.

It took a little bit of experimenting and learning but since the recording function is an extension of PowerPoint many features were intuitive and easy to comprehend in a short amount of time. After experimenting by recording on a laptop, a touchscreen was used with an external microphone (simply by connecting an external HD camera). The touchscreen produced better and smoother results to annotate each slide, which is an engaging feature in a podcast. It took a few iterations but overall was not too time consuming. The first podcast was made on a normal laptop. It didn't take long to learn how to use the record function on PowerPoint, especially annotations that are best done using hands-free drawing tools.

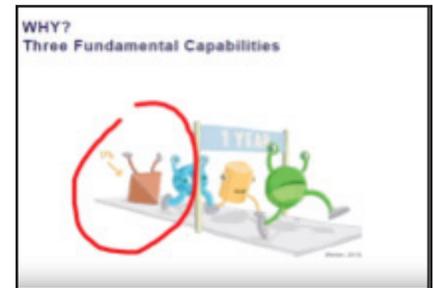


Figure 1 - free hand drawing

In a revised 2nd generation podcast the 'welcome' slide was eliminated, and the podcasts were shorter overall, placing more emphasis on using images with annotations or animations.

## Theoretical underpinnings on selected key concepts from this intervention

### What is video podcasting?

The word podcasting comes from joining the two terms iPod and Broadcasting and is based on the idea of capturing the human voice and sharing this media with others. Panday (2009) explains that podcasts can be public, personal or professional. Professional podcasts can have educational purposes or professional ones. Podcasts can be basic, enhanced or video podcasts, depending on what is added to the capture of the human voice. Overall the key advantage of podcasting is listening to recordings which has been described to be intuitive in contrast to reading or writing (Chan & Lee 2005). However too much audio information can quickly overwhelm listeners (Panday 2009).

### What kind of learning does video podcasting support?

Fleming and Mills (1992) describe four types of learners and preferred learning styles: visual (preference for diagrams, flowcharts, and graphics), auditory (preference for listening to instructions, lectures, or verbal information), reading/writing (preference for from text passages, words, and written explanations) and kinesthetic (preference for hands-on examples, role plays, debates, practice exercises, and simulations) while teaching in modern classrooms involves more and more active learning, problem-solving, authentic learning, and virtual teaming or collaboration online (see also Bonk & Zhang 2007). Panday (2009, p.252) proposes also that the act of listening to podcasts is not a passive engagement but rather a concrete experience where the listener observes and reflects, which are both reflective processes that support in particular the learning of abstract concepts.

## Are there different types of video podcasts?

Kay (2012, p.821) conducted a literature review on the use of video podcasts in education and reports that there are four different types of podcasts: lecture-based, enhanced, supplementary, and worked examples. Lecture-based video podcasts typically present recordings of a lecture style presentation. It means that students do not need to attend classes in person but rather have the option to view whole class presentations from the comfort of their homes/work spaces. An enhanced video podcast is video footage of presentation slides (for example PowerPoint) that are presented with a voice over. Supplementary video podcasts have the purpose to extend materials and activities offered in a course. This typically includes administrative support, real world demonstrations, summaries of class lessons or additional material that may expand student knowledge. Worked examples are video podcasts that offer explanatory notes on selected key ideas and that build skills that students need in order to solve a specific challenge (see also Holbrook & Dupont, 2010; McGarr, 2009; Crippen & Earl, 2004 or Heilesen, 2010).

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# Talking about Practice

## IN-CLASS KNOWLEDGE CONSTRUCTION THROUGH SELECTIVE PODCASTING



Available at: <https://www.youtube.com/watch?v=EFDmR5NaQHo>

Watch this video where Associate Professor Kjeld Nielsen talks about his experience in flipping his teaching approach by using podcasts he generated from existing presentation slides.

# Tools to implement this innovation

## How to turn PowerPoint slides into videos

PowerPoint has a built in Recording function, but it might not seem easily accessible when opening the program. The function is only available for Windows.

1. The first step would be to right click on an empty spot on the Ribbon (grey area on the top of the window) and choose Customize the Ribbon from the pop-up menu as shown on Figure 1.

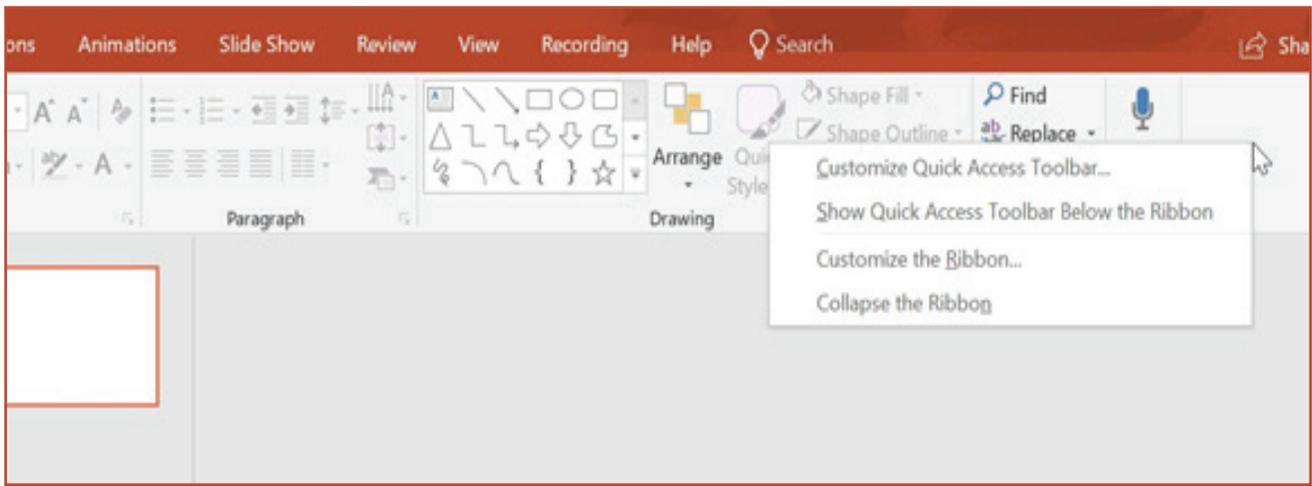


Figure 1 – Opening pop-up menu

2. The second step is to tick the empty box besides Recording and hit the OK button (Figure 2).

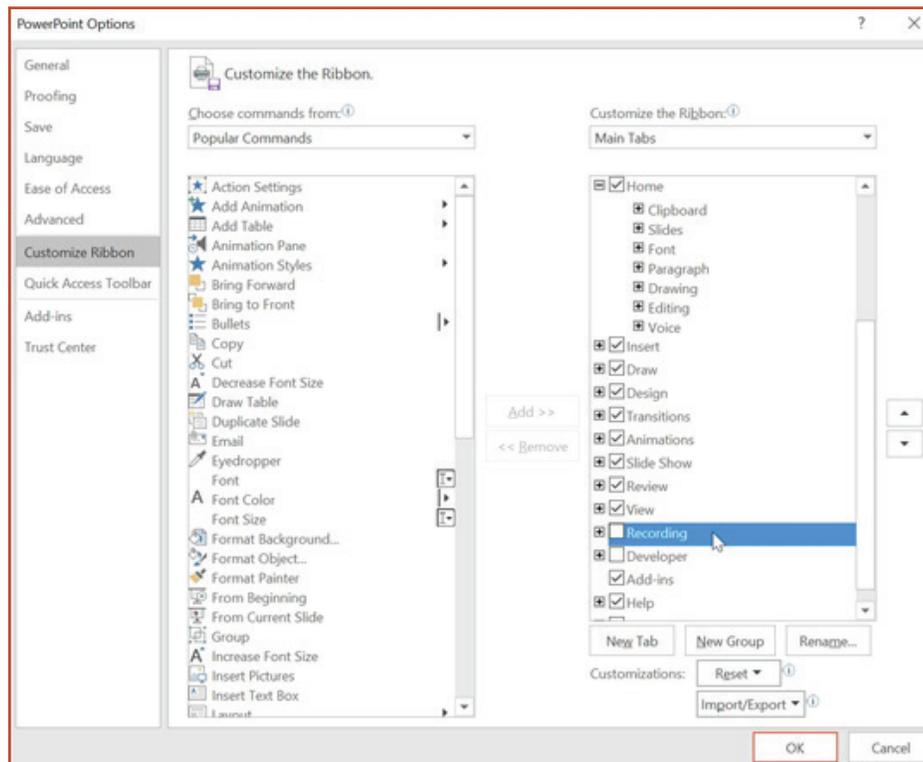


Figure 2 – Customize ribbon

The Recording tab will appear, as shown in Figure 3, below.

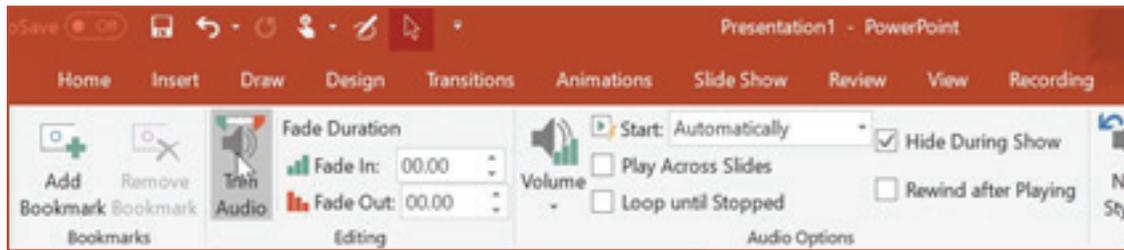


Figure 3 – Recording tab

3. You can record a slide by clicking Slide Recording, as shown on Figure 5, and hand draw on it to highlight parts for example. Or record any other program running on your screen by clicking Screen recording (Figure 4).

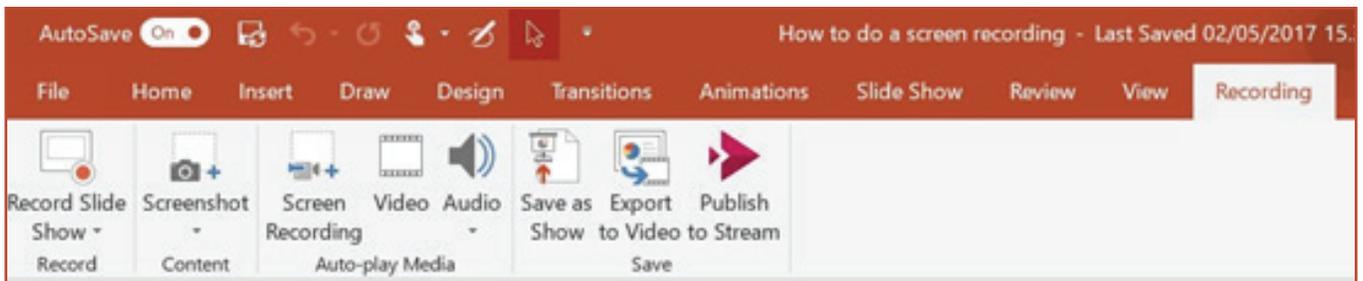


Figure 4 – Record Slide Show and Screen Recording

4. After you have recorded something, a speaker icon will appear in the bottom right corner of the screen. By clicking on the speaker icon the Playback function allows you to edit and trim your audio and there is no need to spend extra time on adjusting it afterwards (Figure5).

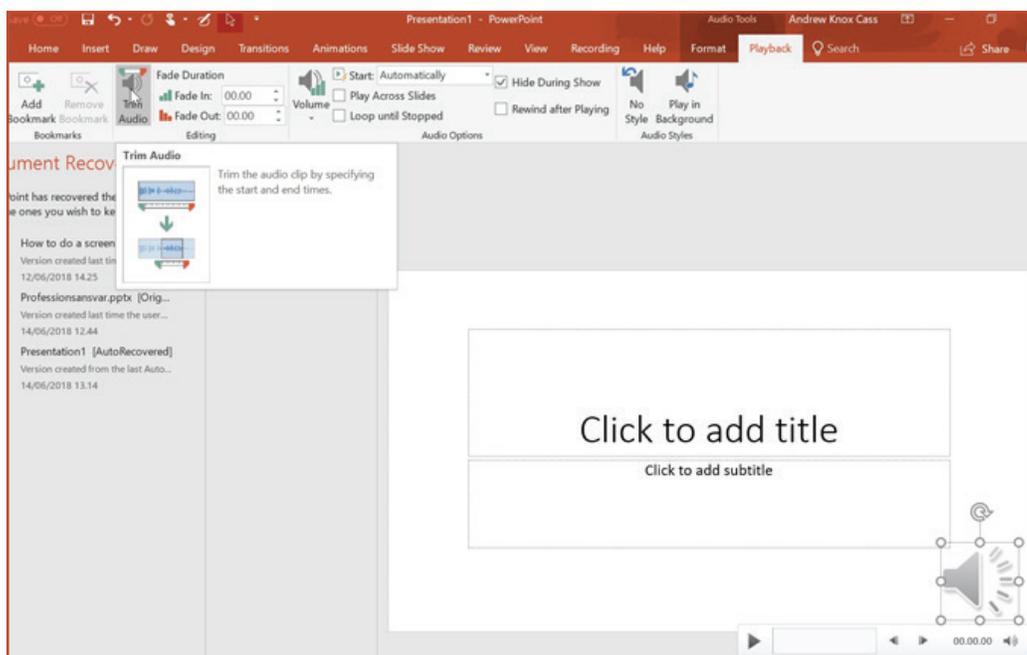


Figure 5 - Trim Audio

5. In order to save your work as a video file In order to save, export it as shown on Figure 6, below.

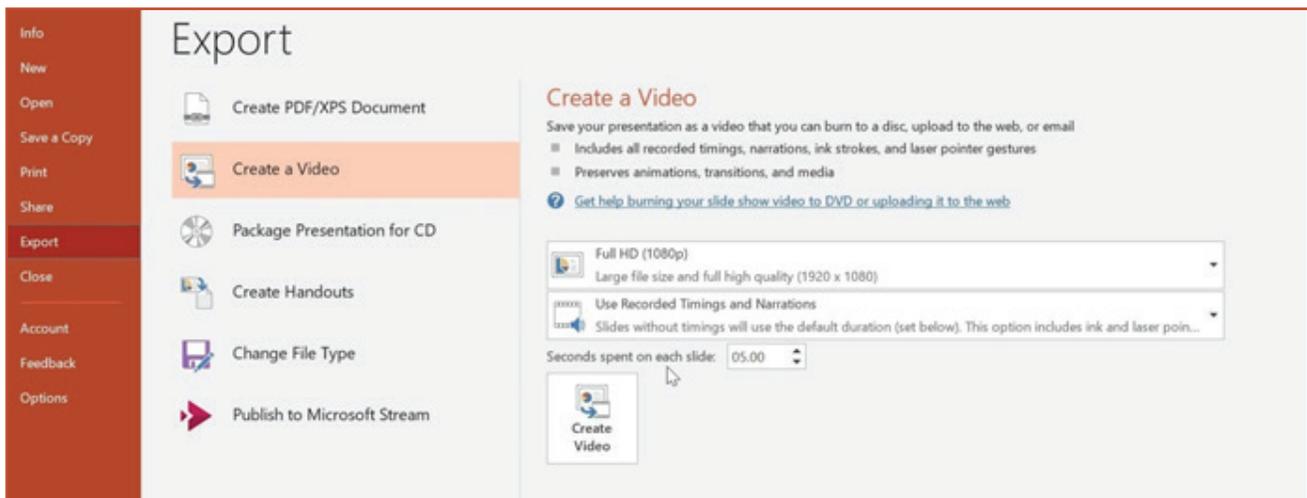


Figure 6 - Exporting video file

(Note that exporting your work in high quality might take some time.)

Here is a video explaining further how to turn slideshows into videos:

<https://support.office.com/en-us/article/video-add-format-and-record-video-bb7fc99c-71ef-48e3-ac1a-3ebafcd-9f3ed>

# 3<sup>rd</sup> Case: Pencasting in the Flipped Classroom

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**Teacher:** Associate Professor Hans Hüttel  
**Course:** Computability and Complexity, 5<sup>th</sup> semester

## Background and Theory

This is a mandatory course that is part of the undergraduate degree programmes in Computer Science and in Software. In fact, courses covering the same topics are part of the usual curriculum of undergraduate degrees of this kind across the globe. At AAU, the course is largely independent of the other courses and of the projects at this particular semester.

The course is mathematical in nature, and the exposition is that of mathematical subjects with the emphasis of definitions, theorems and proofs.

A very important competence is to be able to classify decision problems according to the level of computational difficulty: Are they algorithmically solvable at all, and if they are, what are the resource requirements (time and space) of an optimal solution algorithm? In this context, the important skill is that of being able to prove undecidability and completeness by reducibility, and this notion appears throughout the course in different guises.

The challenge is that students have had little or no experience with rigorous proofs and most have no previous experience with carrying out proofs on their own. The teaching task is to ensure that they acquire the necessary skills to be able to see if and when a theorem has been correctly stated and proved. A complication has been that not all students appear to read the material in the textbook associated or experience difficulties in reading and comprehending a mathematical text.

In other words, there is both conditional knowledge and procedural knowledge that must be established (Biggs and Tang 2011).

My own experience with the course Computability and Complexity has been substantial; it was the first course I taught when I became a lecturer at AAU in 1991. My style of teaching emphasized a traditional mathematical style of presentation with emphasis on presenting definitions, theorems, proofs and examples on the blackboard. This style has allowed me to proceed at a fairly slow pace. Lectures were typically supported by problem-solving sessions carried out by students in their group rooms in support of the PBL tradition.

However, I discovered that students considered the lectures to be much more important than the practical sessions. The emphasis on using the group rooms for problem-solving also led to a lack of efficiency, since a considerable amount of time was spent on assisting several groups struggling with the same problems. Moreover, the group rooms have often proven to be a source of distraction for the students, since many students tend to think of these rooms as their domain rather than as a place where teaching and learning would take place.

As a result of reflecting on my teaching and the feedback from the students I wanted to shift the attention away from the presentations and focus on the problem-solving aspect.

Moreover, I wanted to apply constructive alignment into my teaching and assessment, and create an incentive for students to read the textbook.

## The Intervention: flipped teaching with podcasts

The idea in this intervention was to move the content of the presentations into a collection of podcasts and use the plenary session for problem solving. For each of the 15 sessions of the course I produced four to six podcasts, each of length between 10 and 15 minutes. The intent was that students could watch the presentations whenever, wherever and how often they wanted or needed to. I made it clear to the students that I expected them to watch the podcasts prior to reading the textbook associated with each session and prior to the problem-solving session.

Every session (apart from an extended problem-solving session half way through the course that recapitulated the material of the first seven sessions) had an associated pencast consisting of three to five video segments each having a duration of eight to fifteen minutes. Each segment addressed part of the text associated with the session. The presentation style of the videos involved a combination of handwritten text and recorded sound; the intention was to stay close to the signature pedagogy of the subject and approach the exposition in the style of a chalk-and-blackboard only lecture in which I would let definitions, theorems and proofs evolve as I was writing them. There were almost no recordings featuring me at all, since this was also much easier to edit at the end. The podcasts were recorded using my iPad 2 and the Doceri software. I edited the footage on my Macbook using iMovie HD.

As part of the pencast associated with each session, the exposition ended with a ‘horror story’ intended to highlight typical pitfalls and misconceptions within the topic of the session; this was an extension of the practice within the earlier lecture-based teaching by the second author. Each set of pencasts could be downloaded as a zip archive of Quicktime files released under the Creative Commons licence 3.0. The pencasts are accessible on computers, tablets and smart phones. Initially, each pencast-based session was supported by a discussion forum on Moodle. However, the fora saw very little activity (only two questions were asked), so this activity was eventually stopped.

When the course was taught previously using traditional lecture style, student scribes were assigned each time to write official notes. These lecture notes turned out to be a major advantage since I was able to use them as my manuscript.

It took some time to figure out how to best record the pencasts, and there was a fairly substantial amount of experimentation involved when it came to choosing the right hardware (such as finding a good stylus and a microphone). Moreover, it took me a long time to figure out that it was a much better approach to record several fragments and then cut them together than to go for single-take recordings.

The class of students was comprised of students that I had taught the previous semester, and some of them I had also encountered in the setting of projects from the 1st semester onwards. This turned out to be an advantage, since the students already knew me fairly well and we had a positive classroom culture.

A central goal of the teaching activities was to support the aspect of a thorough reading of the text related to the session. Therefore, each session involved a collection of text-related questions that focused on the declarative aspects of the learning goals. The students could submit their answers via the Moodle platform at fixed deadlines and their answers constituted a personal portfolio, i.e. a collection of personal documents that were allowed at the final exam as the only aid.

The answers had to be written in LaTeX and were subjected to a peer review by a fellow student.

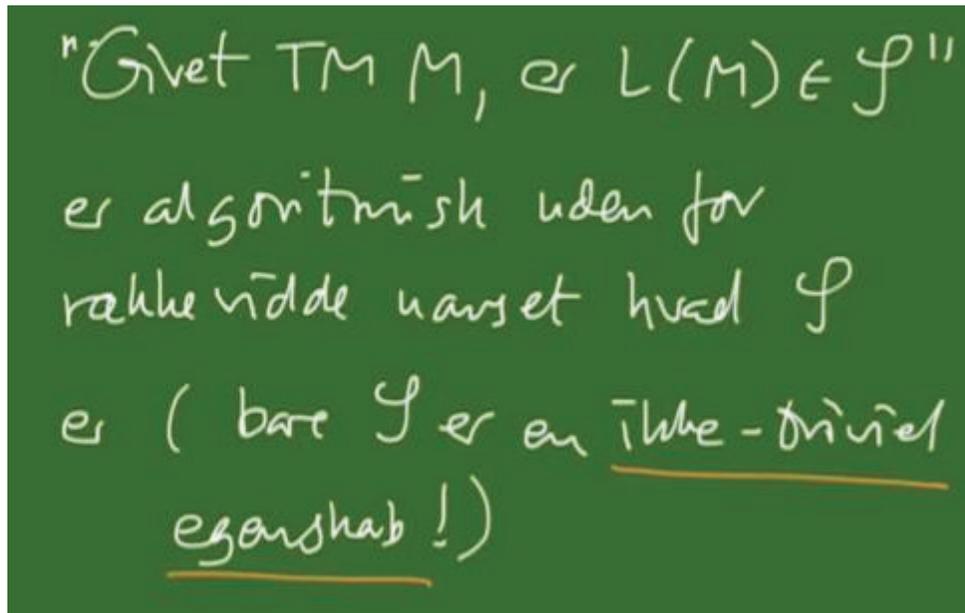


Figure 1. Screenshot from pencast

Each pencast session had an associated practical session. Due to constraints on rooms, the students were distributed over three large seminar rooms for these practical sessions. Each practical session involved solving a problem set that would focus on central notions (definitions, theorems and their proofs and associated proof techniques). The problems in each set were deliberately chosen to be similar in form and content to ones that students would encounter at the final exam.

I prepared a document outlining my intentions behind the flipped format and asked the students to read it before the first session. Moreover, I briefly explained the format at the introduction meeting at the start of the semester.

At the end of the course, the students were given a questionnaire focusing on evaluating student learning. 40 out of 101 students answered these questions, which aimed at determining the perceived effects of pencasts on their learning experience. The vast majority felt that the pencasts indeed supported their learning. Moreover, a series of qualitative interviews were carried out by Dorina Gnaur from the Department of Learning and Philosophy. The reflections resulting from the interviews later became the basis of a conference paper.

Students were also asked, which of the activities of the course that, in their opinion, were most helpful for learning. The answers indicated that the intent of the teaching design, namely to emphasize the importance of problem solving, was fulfilled. Pencasts as such are not producing

learning; yet they are valued in combination with an active learning element such as problem solving.

One of the drawbacks that we discovered from the interview was that there was less time spent on teacher-group interaction, which was something that some of the respondents missed.

Another drawback was that a number of students put more emphasis on the text-related questions than on the problem-solving sessions, as they tended to think of the portfolio not as a strategy for reading the text but as the only aid allowed at the written exam.

Since 2013, I have used the flipped format in Computability and Complexity and also in the course Syntax and Semantics whose signature pedagogy is very similar. One surprising observation was that a sizeable fraction of the students appeared to prefer staying in the group rooms to the extent that they would not attend the plenary prob-

lem-solving sessions. A future adjustment to avoid such an outcome would be to include some significant activities in the plenary problem solving sessions that would encourage students to attend those classes.

Summing up, the most important lessons I have learned are

- Pencasts are a good approach to creating podcasts, as they are faithful to a well-known strategy for presenting mathematical content, but the hardware and software used must be able to facilitate recording and editing. I now use an iPad Pro and the Explain Everything app, as this allows me to edit on-the-fly. For post-production in the form of additional voice-over, editing, titles etc. I use Camtasia.
- It is important to explain the pedagogical intention behind flipped teaching to students. Otherwise students may misinterpret such a learning design.
- Student instrumentalism may be a dubious source of motivation; one must be aware that some students are prone to thinking that the central focus of teaching activities is another than that which is intended by the teacher.
- It is tempting to focus on the podcasts in flipped classroom teaching, since their production can take a lot of time and effort, but it is important to remember that the intention behind the flipped approach is to shift the focus away from presentations to active learning activities. The focus of the teaching preparations should therefore be the design of these activities.

## Theoretical underpinnings on selected key concepts from this intervention

**Knowledge of mathematics** includes knowledge of mathematical concepts and procedures, how they can be formalized and how the relationships among them appear in mathematical theories; and in particular, how knowledge in a mathematical theory is captured in the form of theorems and what constitutes a valid mathematical proof. In his seminal work, “Signature Pedagogies in the Professions” (2005), Lee Shulman explores the universal and the specific “habits of mind” that distinguish each discipline, and how this articulates a signature pedagogy that teaches students the distinctive practices, in this case the mathematical reasoning. Mathematics involves not only one, but several teaching perspectives (Blair, 1981) or signature pedagogies centered on key mathematical aims, e.g. interest-driven problems, conceptual reasoning and multiple representations, approaches and solutions, collaborative solution generation (Ernie et al., 2009). This becomes especially useful in the context of learning technologies as these have the potential to revisit available mathematical practices and support new pedagogies (Passey, 2012).

**Knowledge of students** and how they learn mathematics includes general knowledge of how various mathematical ideas develop. It includes familiarity with the common difficulties that students have with certain mathematical concepts and procedures, and it includes knowledge about learning and about the sorts of experiences, designs, and approaches that influence students’ thinking and learning. In online learning environments, students are found to adhere to traditional signature pedagogies, that is prefer the face-to-face traditional method in mathematics teaching and learning when lacking of experience in learning mathematics in a non-traditional manner (Krishnan, 2016). Transitioning to new, online teaching and learning methods benefits from emulating aspects of the respective teaching observance, such as ‘chalk-and-blackboard’ for mathematical reasoning. Pencasts have been found particularly useful in this respect, especially when used as supplementary resources to help students understand core disciplinary topics (Shaffer & Schwebach, 2015).

### **Knowledge of teaching practice in a flipped class environment.**

Flipped classroom (FC) can potentially enhance autonomous learning and increased motivation. This builds upon knowledge of teaching practice regarding the curriculum and the study plan including the learning goals,

knowledge of tasks and tools for teaching important mathematical ideas, knowledge of how to design and manage the disciplinary discourse and interactions, as well as knowledge of moral norms that support the development of mathematical proficiency. The FC approach aims at activating students to become more autonomous and self-motivated learners. Mazur et al. (2015) have found inquiry-based strategies particularly powerful in eliciting student engagement together with the flipped teaching method. Inquiry-based learning is stimulated through processes of raising questions, problems or issues, thinking creatively about possibilities, becoming proficient in providing evidence, making decisions, justifying conclusions, and learning the ways of building upon and challenging the knowledge of the field of study. Teachers need see themselves as designers of engaging scenarios for how students can interact with the disciplinary knowledge made readily available.

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# Talking about Practice

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IN-CLASS KNOWLEDGE CONSTRUCTION THROUGH SELECTIVE PODCASTING



Available at: <https://www.youtube.com/watch?v=uDjjUcoFNF4>

Watch this video where Associate Professor Hans Hüttel talks about his experience blending his teaching by using podcasts.

# Tools to implement this innovation

## Recording a podcast with Explain Everything

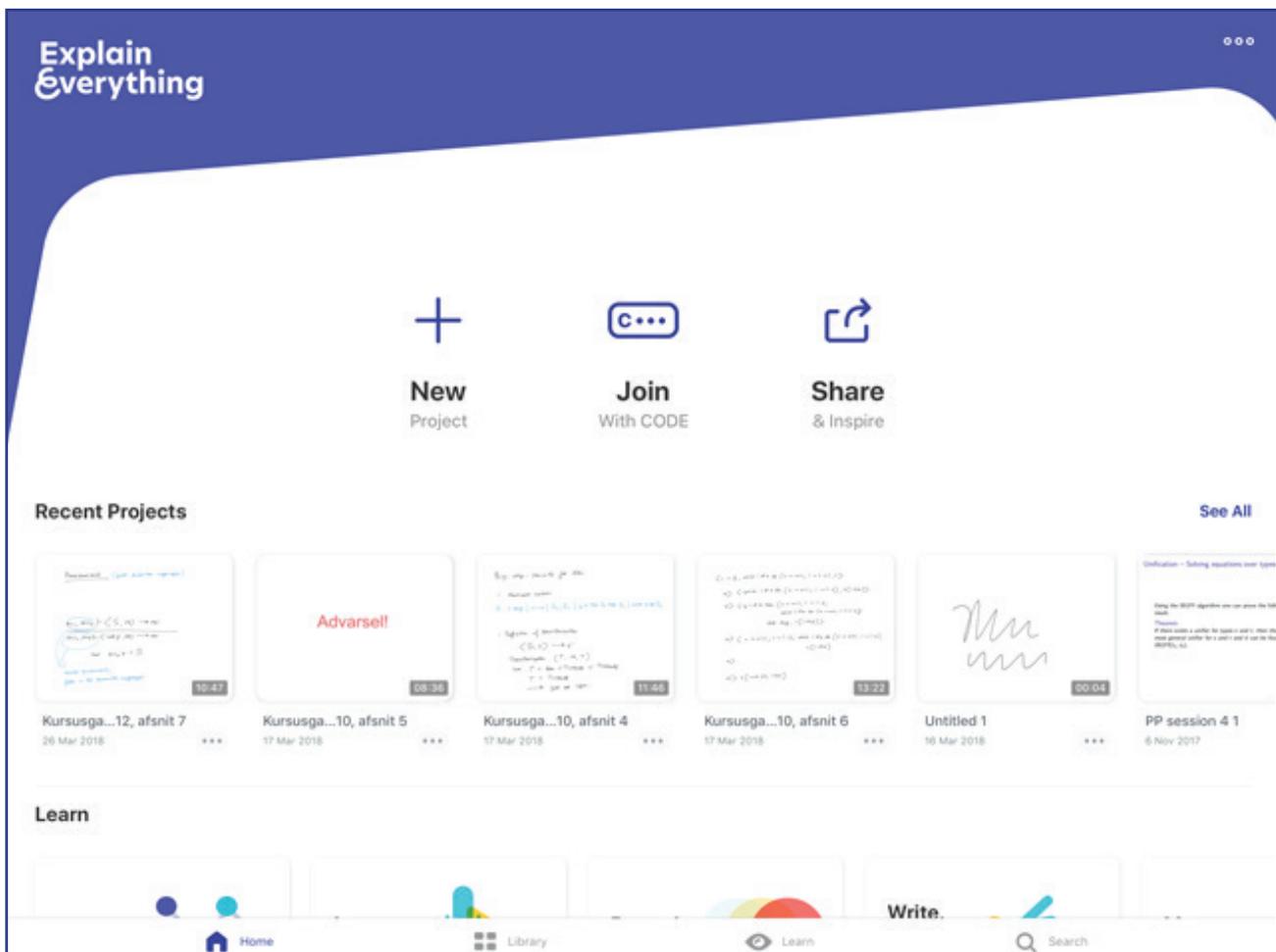
What is Explain Everything?

The app Explain Everything (<https://explaineverything.com>) is a good choice for making podcasts but also for making simple slidecasts, including ones that combine features of slidecasts and podcasts – as well as live video.

Explain Everything is available for the Apple iPad as well as for Android Tablets. The app works particularly well with the Apple Pencil. It will cost you €24.99; this is well worth the expense.

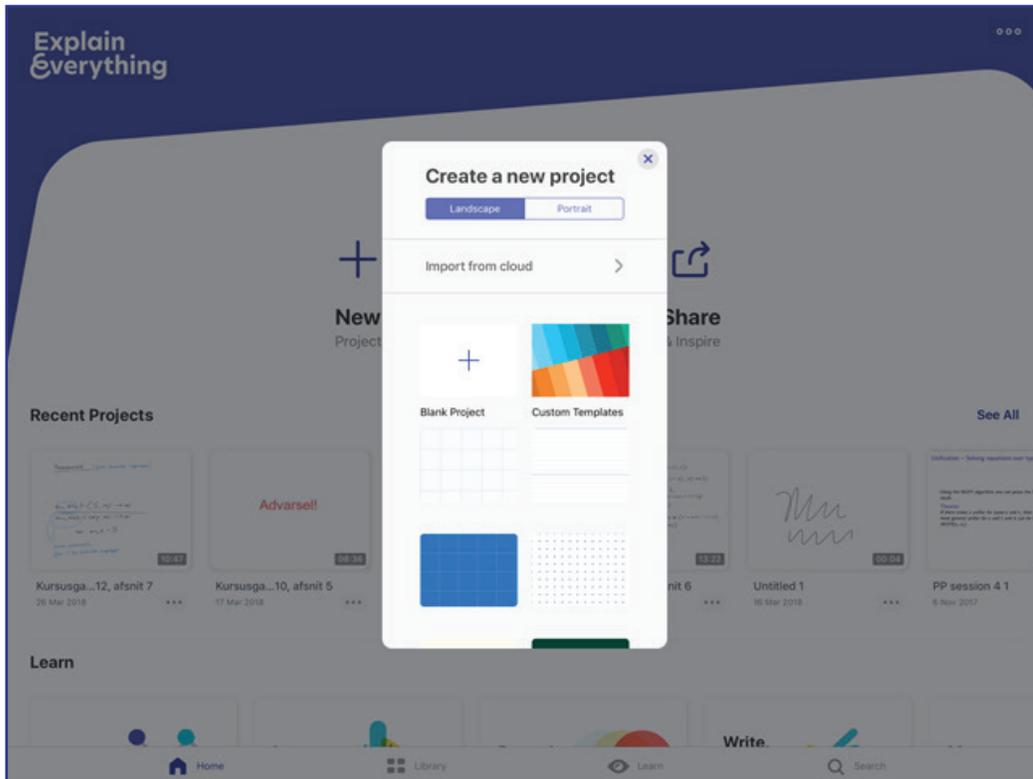
How to begin?

To use Explain Everything, download and install the app from your app store of choice. Then open the app. This is what you will see: The choice between creating a new project, re-opening an existing one that you made, joining someone else's project and sharing your project with others.



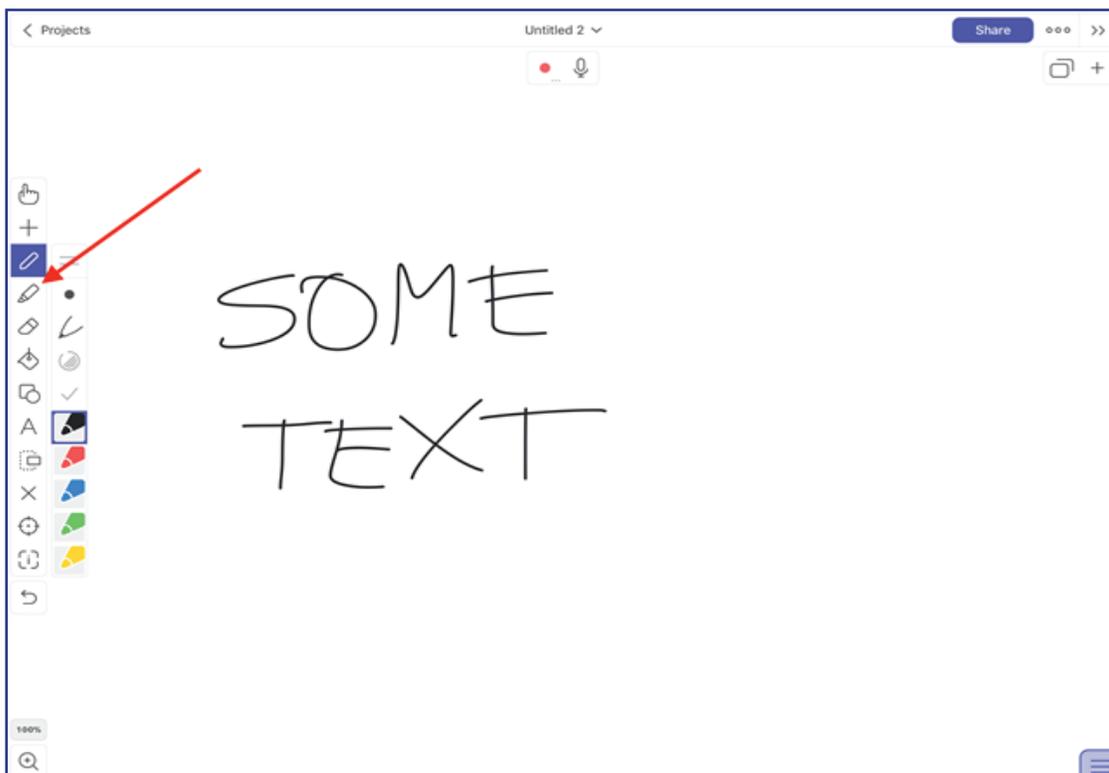
## Create a new project

Here we assume that you are about to make a new project – in other words, you choose the icon named “New”.

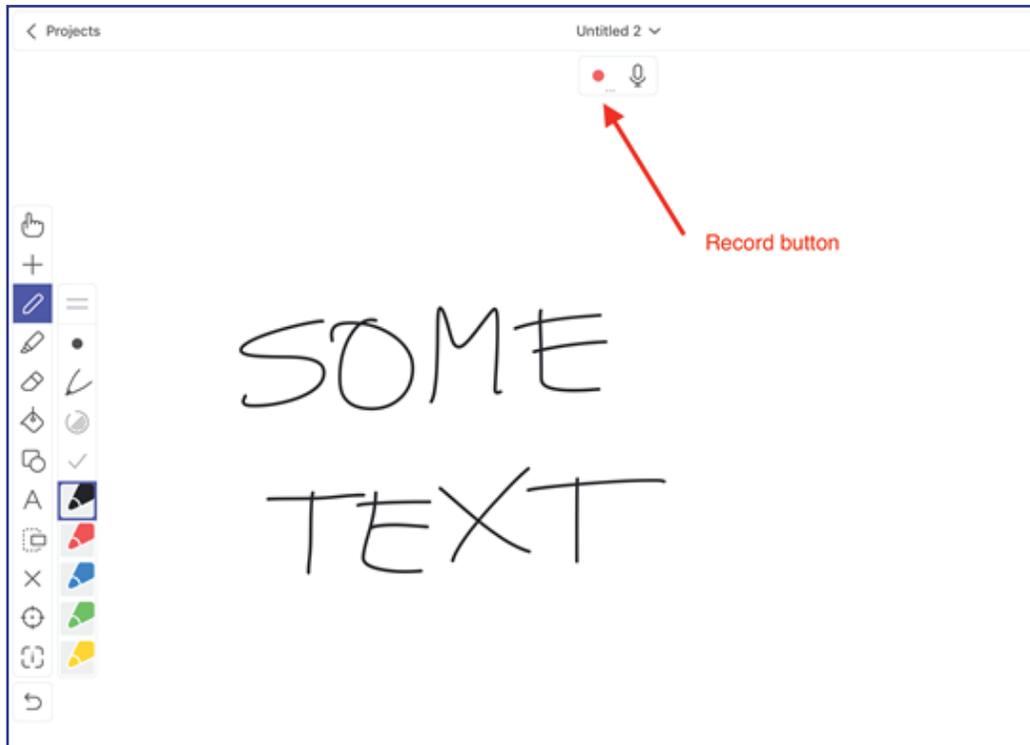


## Creating content

You can add handwritten content by using the stylus tool. It lets you set several parameters such as colour, width and shading.

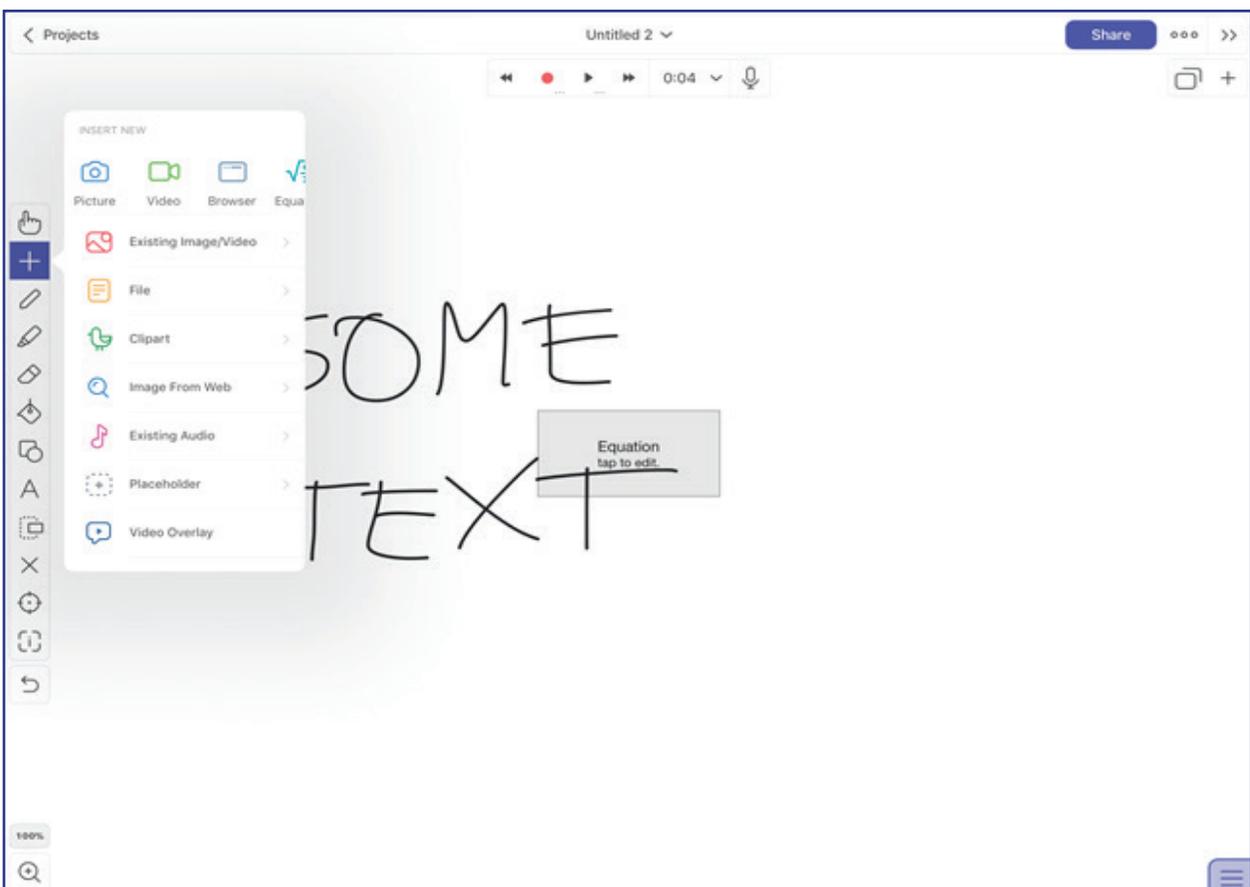


As you write, you can record what you do and say using the record button. The video and audio content will be attached to your slide.



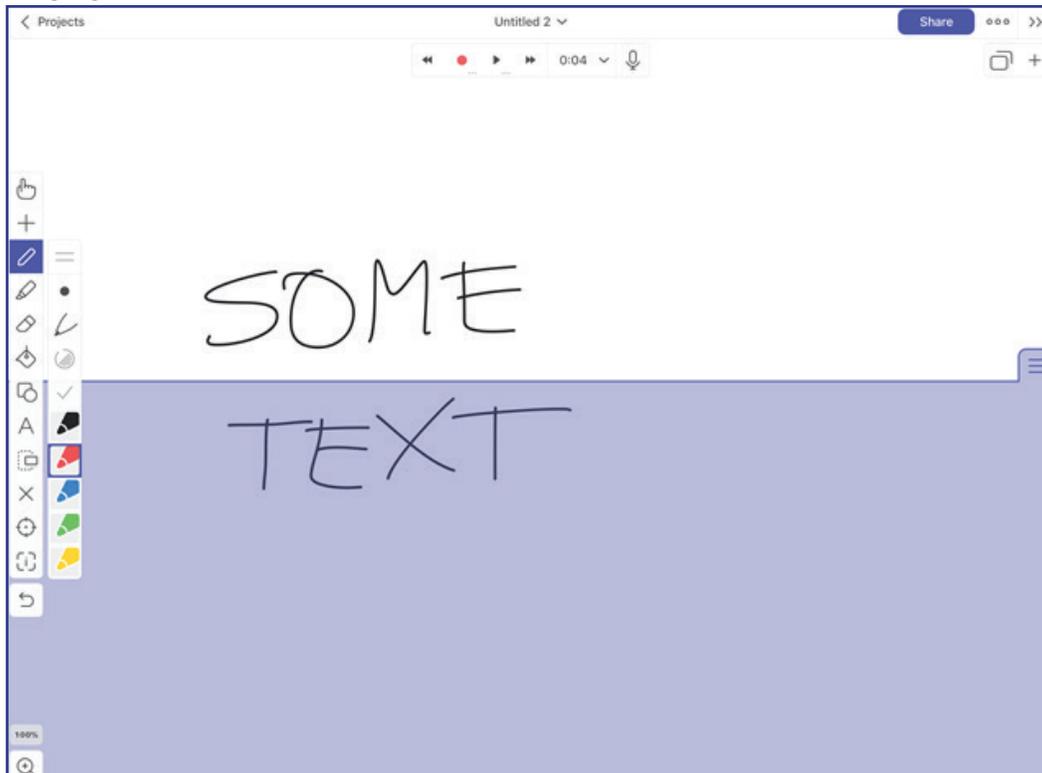
## Importing content

You can import existing content – such as already existing slides – to your presentation. In this way you can use Explain Everything to create a slidecast; simply start by adding the slides from a file.



## The wristguard

Those who use an Apple iPad with an Apple Pencil need not worry about this, but all other users can use the wristguard to allow you to rest your hand on the touchscreen while writing. The wristguard resides in the lower right-hand corner of the screen; pull it up or down by sliding. All movement in the shaded area will be disregarded; this will prevent smudging.



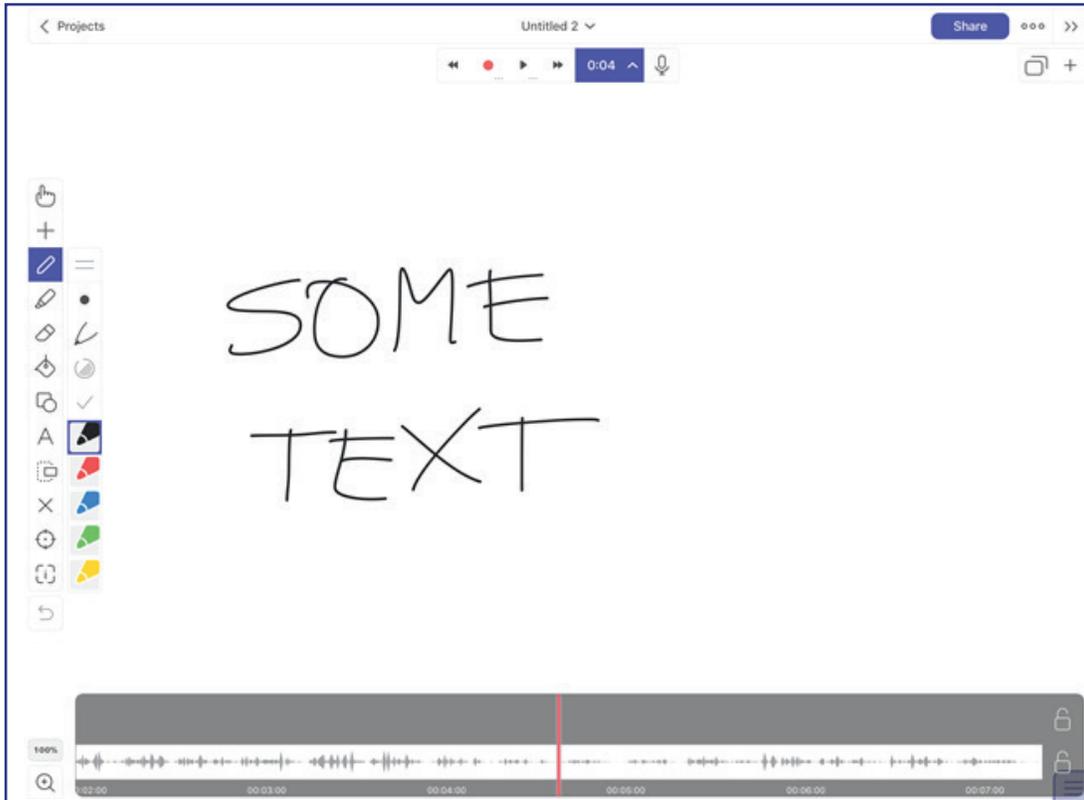
## Creating new slides

You can easily add new slides and move between them using the menu icons at the top of the screen.



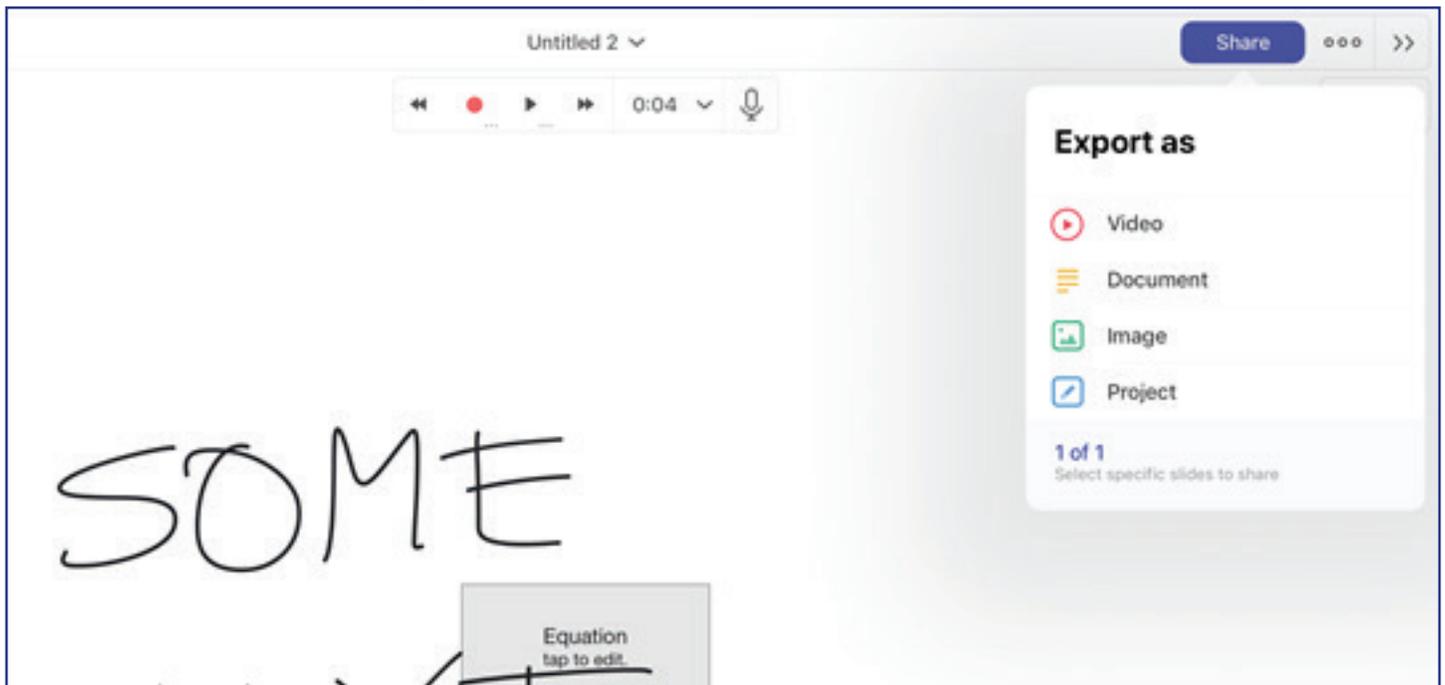
## Editing recorded content

Every slide can have a recording associated with it. You can modify the audio and video content of a slide by invoking the timeline. Slide the red marker back and forth and then press the record button to re-record the content, beginning from the location of the marker.



## Exporting the final project

You can export your content by using the Share icon; you are first asked to save your project, and after that you have a menu of options. You can choose to share your project as a video comprised of all the recordings associated with the slides, a document comprised of PDF versions of the slides or images.



# 4<sup>th</sup> Case: Google+ for blended learning interactions

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**Teacher:** Associate Professor Nicolai Steinø  
**Course:** Parametric Urban Design, 4th semester

## Background and Theory

This case describes the introduction of Google+ as communication platform for a blended learning course. The course in question is a 4th semester introductory course to parametric urban design in the workshop format. The course is a 5 ECTS mandatory course in the architecture and design programme. Parametric design involves programming with specialized parametric design software. This is alien to architecture and design students at this level. In order to obtain satisfactory results, students therefore have to collaborate and share. As both concepts, methodologies and technologies are new to the students, intensive supervision is required.

Blended learning and flipped classroom offers itself as the most appropriate format for a successful course under these circumstances. Blending online teaching and hands-on workshops, frees up valuable instruction time for supervision rather than lecturing. And this essentially allows for a flipped classroom format, whereby students study theories and concepts from video lectures and other online material and try to apply them in their assignments, on their own or in pairs without instruction. While in class, time is spent to discuss past learning, and to go over challenges and techniques based on the students' own experiences.

An important aspect of the setup is the sharing of work in progress for others to learn from. As the code which the students are programming does not in itself elicit the designs which it will generate, as basically it is just lines of text. Therefore, it is important to visualise what the code does. This can be done by means of screenshots from the parametric design software. But as parametric design is all about being able to modify a design by way of parameters (hence the name), visualisation by means of (gif) animations is even better, as they may reflect the changes to the design which the changing of different parameters may produce.

In order to facilitate the students' sharing of code – something which is explicitly encouraged in the course, as you can learn a lot from examining others' approaches to coding – as well as visualisations in the form of screenshots and animations, an online platform suitable to this end was required. Moodle, which AAU uses as its general e-learning platform across all programmes, is not suited to this end (as it is conceived mainly as a top-down, instructor-oriented platform). Therefore, an alternative had to be found.

## **The Intervention: Google+ with online videos, media and assignments**

This teaching initiative was not supported through funding and the platform of choice had to be therefore free of charge – and preferably add-free. It had to be easy to set up, manage and use (which is a serious constraint of Moodle), and finally, it had to be restricted (not public). After some research, Google+ was chosen, as it fulfils all of these requirements.

Once set up and introduced, students were asked to sign up for the G+ community. The community was organised into categories for tasks, messages, documents and links, submissions, discussions, as well as for each of the six course sections which the students had to go through in order to complete the course. In a blog-like structure, posts could be added into each category. While the instructor would post assignments and general info into the tasks and messages categories, students would post working material into the respective course section categories (see figure 1), questions and answers into the discussion category, and partial submissions into the submissions category.

While most students seemed to quickly learn how to use the platform, there was much variation as to whether they would actually do so. During the early phases of the course, there was some hesitation towards sharing material. However, as soon as the students understood that sharing improves the learning of everyone – and that workshops depended on material to be shared for discussion, sharing took on. Throughout the course, asking questions to the supervisors between class hours was consistently popular. As a smartphone app for Google+ exists which makes this feature function much like sms texting, the supervisor would respond quickly whenever possible.

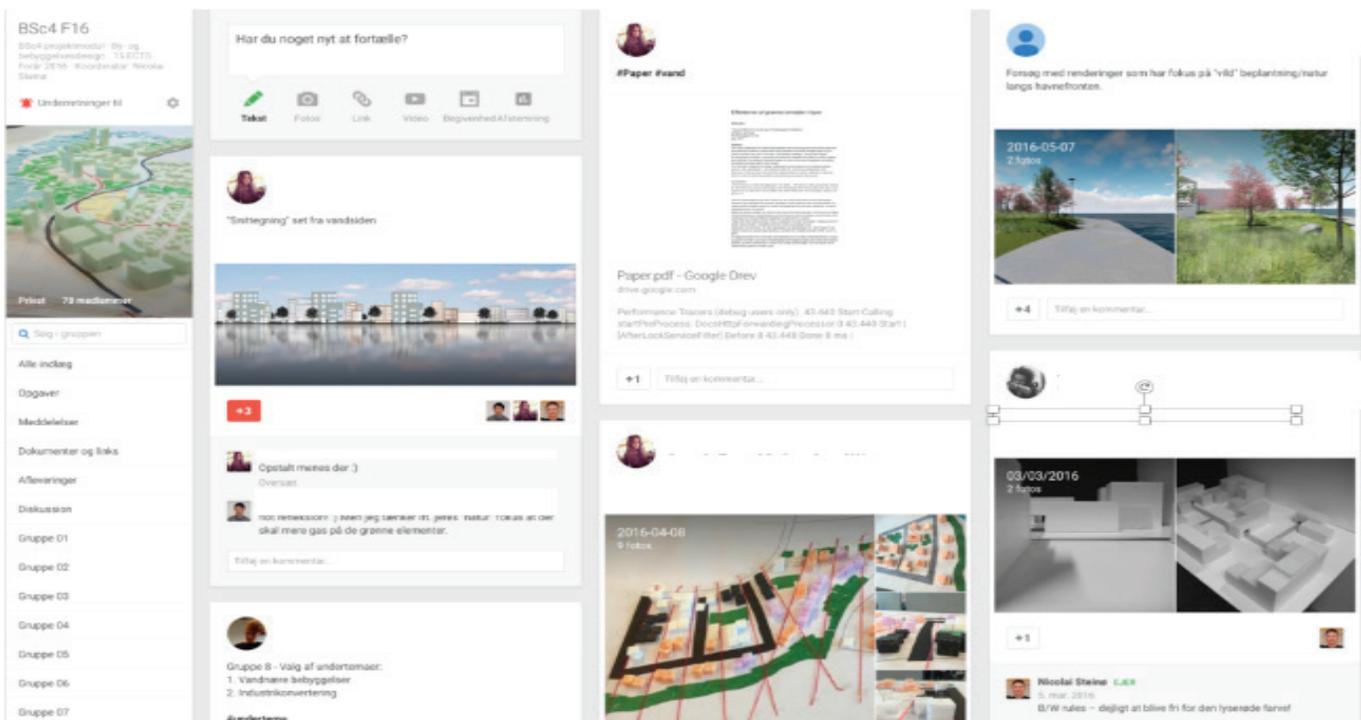


Figure 1: Screenshot of posts (section drawing (with comments), theory paper, renderings, message, and physical work model photos) in Google+ group category.

## Theoretical underpinnings on selected key concepts from this intervention

### *The studio learning format*

Architecture and design are form-making disciplines and are thus fundamentally based on creative processes. They deal with configurations of physical form and space for the purpose of fulfilling criteria for use, construction and aesthetics. Hence, architecture and design education is focused on the creative processes of form-making. As it has been beautifully demonstrated in the documentary film *Archiculture* (Krantz & Harris, 2013), teaching programmes in architecture and design are traditionally oriented towards studio teaching and project-based learning (Parsons, 2007), and, as contended by Turkienicz & Westphal (2012), in a problem-solving format, i.e. solving design problems of varying complexity.

In addition to this, critical partners – professors or invited guest critics (practitioners and/or academics) give their opinion and their comments on the students’ work in progress, play a major role in the traditional architecture and design studio learning format (Krantz & Harris, 2013). In extension, peer learning through sharing of visual material and work in progress (sketches) is central to the studio learning format. Learning from precedents (Potamianos, 2012) or past examples of “good architecture” (Chen & Heylighen, 2012) plays an important role in building a design vocabulary. The PBL studio project modules of the AAU architecture and design programme take their point of departure in a design challenge which the students will try to respond to through repeated cycles of design. The PBL review format is based on a critical approach of questions and dialogue from both experts and peers.

### *Blended Learning Studio Course using Google+*

The pros and cons of traditional and online learning have been much debated. But as several studies seem to suggest, rather than contemplating the complete substitution of online courses for campus-based courses, what may drive learning to new levels, is the combination and integration of ICT with face-to-face learning in what is generally referred to as blended learning (Rovai & Jordan 2004; Lim, Morris & Kupritz, 2007; Aspden & Helm 2004; Garrison & Kanuka, 2004; Steinø, 2015). In traditional courses as well as in blended learning formats, social presence, or the psychological distance which exists between students, and students and instructors/teachers, is important for successful learning outcomes. Establishing a sense of connectedness is particularly important in collaborative online learning (So & Brush, 2008). The emotional learning climate, the sense of intimacy and immediacy, as well as the feeling of being connected and to belong, is an important indicator of the effectiveness of the learning (Wu, Tennyson & Hsia 2010).

More specifically, Erkollar and Oberer (2011) report a study on educators’ preparedness to integrate Google+ in a course in higher education and cross-course Google+ integration. The authors also reported a research design, which compared Google+ functionalities with Blackboard by devising and applying three hypotheses in relation to collaborative (student-student, student-group) communication functionalities available in Google+, core learning activities offered and implemented through a learning management system (LMS), and student-instructor interaction in LMS versus Google+. Kang et al. (2015) investigated and suggested in favour of using Google Plus as a project-based learning platform for higher education context.

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# Talking about Practice

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## GOOGLE+ FOR BLENDED LEARNING INTERACTIONS



Available at: <https://www.youtube.com/watch?v=dk0sbOXO4GQ>

Watch this video where Associate Professor Nicolai Steinø talks about his experience blending his teaching by integrating Google+ features.

# Tools to implement this innovation

## Google+ Communities

Google+ is good for flipped classroom teaching which involves sharing of documents or graphic material and frequent student-to-student and student-to-instructor communication between classes.

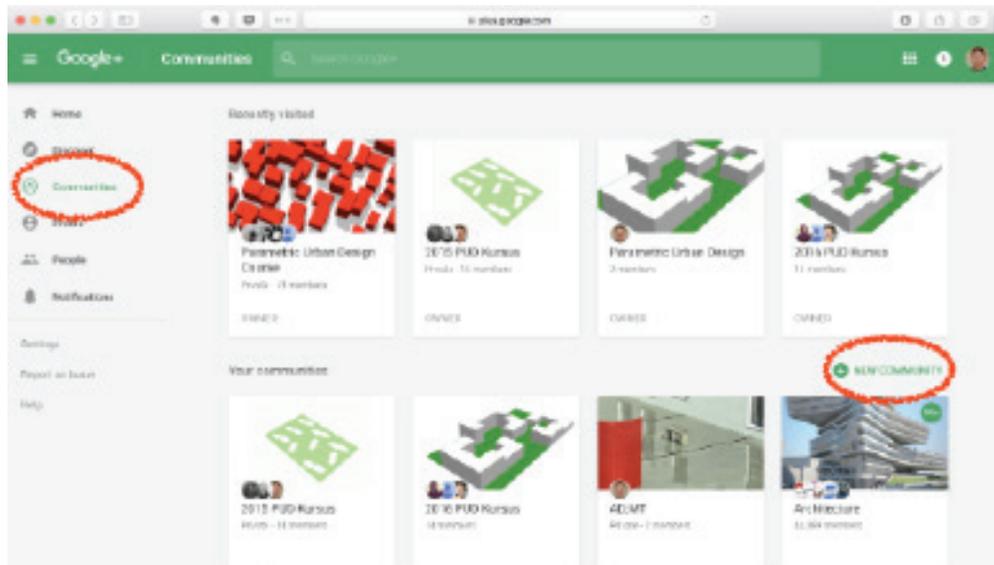


Figure 1: In Google+, click 'Communities' in the left hand navigation menu and then click 'New community' next to the title 'Your communities' to create a new community.

## Introduction

Google+ (Google plus) is a social media platform which can be used for 2-way communication and document sharing. In Google+ it is possible to set up so-called communities. A community has a news stream similar to other social media platforms, and it can be organised into a set of categories. It works much like a Facebook group, but has the advantage of not having friends, advertisements, or other distracting elements cluttering the interface. Google+ communities are free to use (on the same conditions as other Google products), easy to set up, and easy to use. All members of a Google+ community can write posts and share material. It also has a very good smartphone/tablet app, which makes it very handy on the fly. As such, it is a good alternative to Moodle, which is complex to set up for student-to-student and student-to-instructor interaction, more cumbersome to use, has little support for student-to-student shared material (which is practically impossible) and has no functional smartphone app.

Creating a Google+ community requires a Google account. Anyone who has a gmail automatically has a Google account. Communities can be set up to be public or private. For teaching purposes, you would probably want it to be private in most cases, so that not anybody on the internet can join. You can require people to ask for permission to join the community. This way, you can control who is admitted. The downside of this is, that you will have to spend time reviewing requests and giving permissions.

## Setting up your community<sup>1</sup>

This section explains how you set up a community in Google+. It also explains how to pin a post.

### **Creating a Google+ community:**

1. On your computer, open Google+ by navigating to [plus.google.com](https://plus.google.com).

2. In the Navigation menu, click 'Communities'.

3. Next to 'Your communities', click 'New community' (figure 1).

4. Enter a name, make the community public or private, decide whether people need to ask to join the community and whether a member's posts are held for review until the member has been approved to post in the community.

5. Click 'Done'.

### **Edit your community:**

You can change the communities

that you've created, including:

- The community's name
- The cover photo
- Whether or not people need to ask to join the community
- Whether or not a member's posts are held for review until the member has been approved to post in the community

You can also add categories, links and a description.

To edit your community:

1. On your computer, open Google+.

2. In the Navigation menu, click 'Communities'.

3. Under 'Your communities', click the community that you want to edit.

4. Click More (vertical ellipse ...).

5. Click 'Edit community'.

6. Make your changes.

7. Click 'Done'. The text for this section is based on the Google+ Help item 'Create or edit a Community', [https://support.1-google.com/plus/answer/6320395?hl=en-GB&ref\\_topic=6320361](https://support.1-google.com/plus/answer/6320395?hl=en-GB&ref_topic=6320361)

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<sup>1</sup>The text for this section is based on the Google+ Help item 'Create or edit a Community', [https://support.1-google.com/plus/answer/6320395?hl=en-GB&ref\\_topic=6320361](https://support.1-google.com/plus/answer/6320395?hl=en-GB&ref_topic=6320361) Google+ wikihow

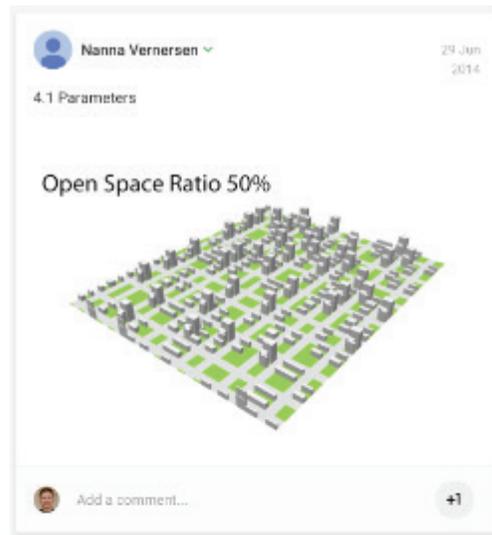
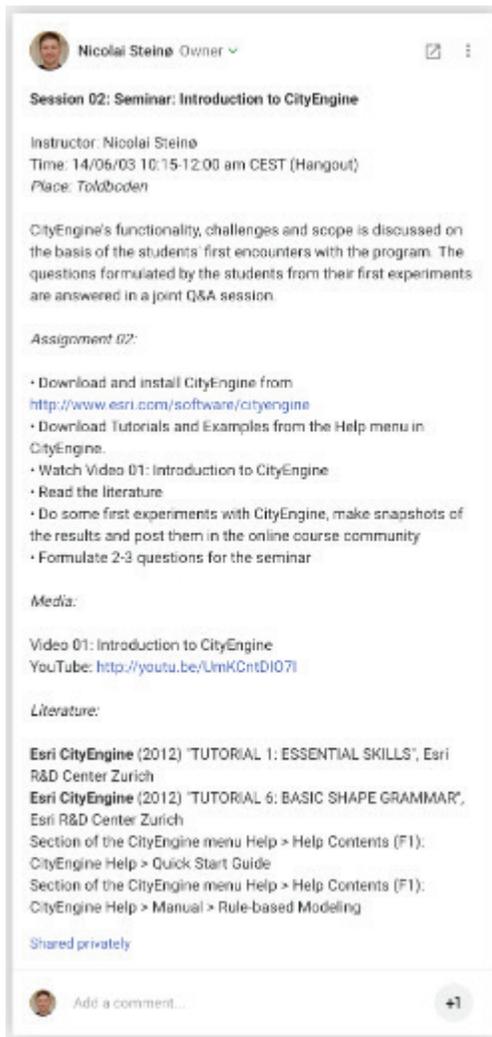


Figure 2: Examples of a post for a course session with assignment, media and literature posted by the instructor in preparation of the course (left) and a post for work in progress with a graphic image posted by a student during the course (right). Notice how text has been formatted in bold and italics to provide overview (left).

## Pin a post

You can pin a post so that it remains at the top of your community's page:

1. On your computer, open Google+.
2. In the Navigation menu, click 'Communities'.
3. Under 'Your communities', click the community that you want.
4. Click the post that you want to pin.
5. Click More (vertical ellipse ...).
6. Click 'Pin to community'.

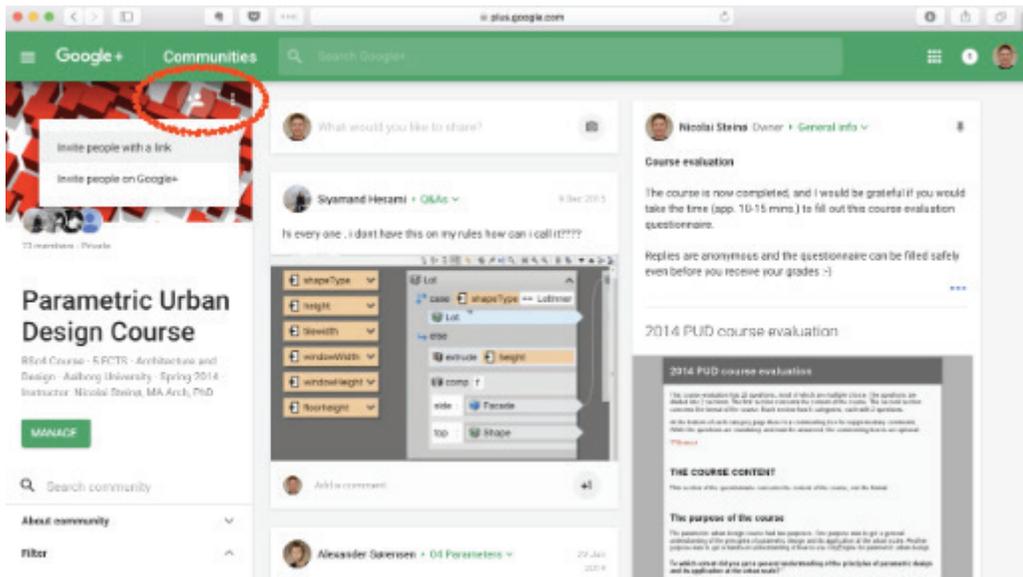


Figure 3: Invite people to your community by clicking on the Invite people symbol at the top left. You may invite people directly in a dialogue box, or you may retrieve an invitation link which you can distribute by eMail, on Moodle or in similar ways. People are invited by adding their eMail addresses. Large numbers of people may be invited by copying their eMail addresses from eMail lists in spreadsheets or text documents.

## Preparing your community

This section explains how you organise the community and fill in content before publishing it to your students.

## How material is organised

All information in your community sits in posts. Any member of the community may add posts anywhere (figure 02). Posts may contain text, links, images, polls and locations. Text can be formatted as bold, italics, etc., using simple markdown. Any member of the community may comment on any post. Comments may contain images and links. Hence, posts is where you put your course material, your communications – anything. Learning how to add content to a community is therefore very simple. But if you do not structure your material carefully, this is also why a community may potentially get messy.

## Setting up categories

Categories in Google+ is what adds structure and overview to the community. While there is a maximum to how many categories you can have, you may use them to for practically any-thing. For course modules, the categories may favourably be used similarly to course topics in Moodle. But additional categories such as ‘Sessions’ for course material and info by course session, ‘Q&As’ for general inquiries, and ‘General info’ for course communications which are not session specific may also prove handy.

<sup>2</sup>Read here for how to format text in Google+ posts and comments: <https://plus.google.com/+GplusExpertise/posts/9mfNT-jFtPAm>

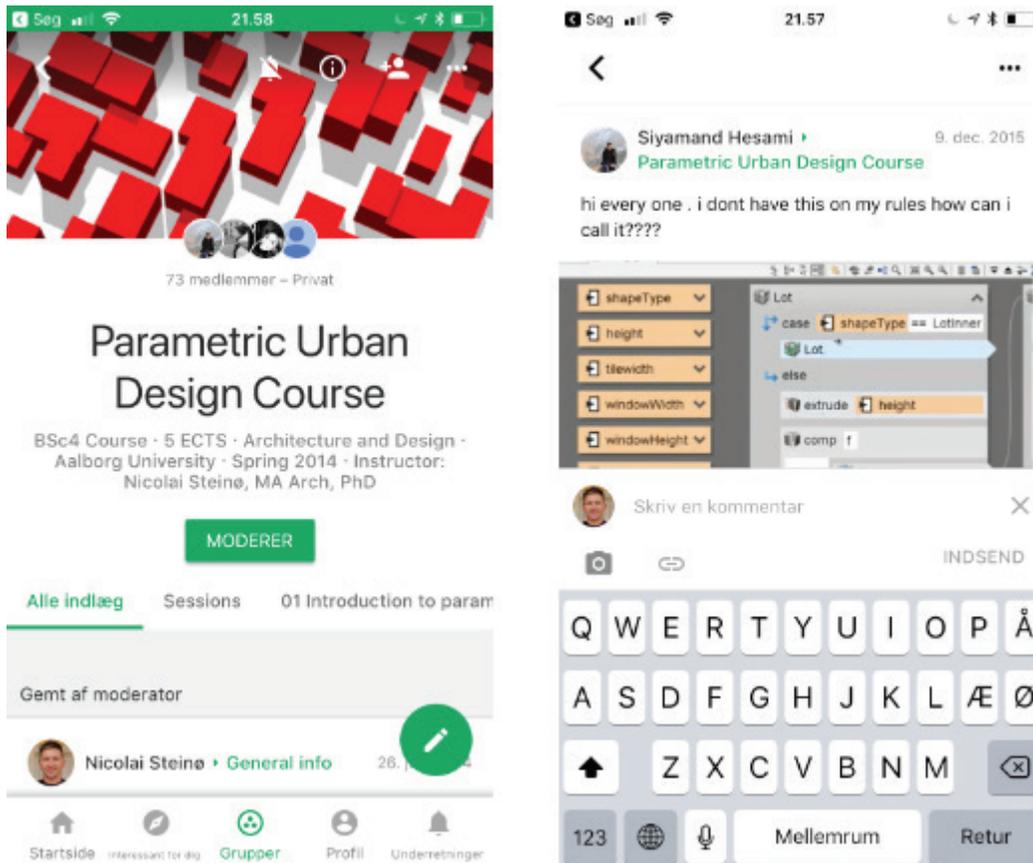


Figure 4: Google+ works very well on a smartphone due to the Google+ app. While you cannot do all the things on a smartphone which you can do in the browser version on a computer, it is easy to navigate (left) and write posts or comment on other people's posts (right). But first and foremost, the mobile app allows you to get notifications and possibly respond to them when you are away from your computer.

Consider that in each category, material is organised in a stream with the oldest material at the bottom. Therefore, it is practical that posts containing course session descriptions with course material and other posts which contain material which is likely to be revisited throughout the course are kept in separate categories, while day-to-day communication and sharing of work in progress is kept elsewhere. In order to help finding older posts, #tagging with keywords is a powerful way to facilitate searches.

TIP: If a category holds only static material in posts which were added before the students were invited to the course, you may consider the sequence in which you add the posts. If for instance, you want a category reserved for sessions, you may add the posts in inverse order, with the last session first. As posts are organised as a stream with the oldest posts at the bottom, this will have the first sessions at the top of the category, just as most people would expect them.

### Adding members to your community<sup>3</sup>

Once you have added the categories and content to your community which you want to be there once the course begins, it is time to add students and fellow instructors to the community. If your community is set to 'private' or 'request to join', inviting someone will add them to the 'Invited' members list. Only moderators and owners can see the list

<sup>3</sup>The texts for this section and the next are based on the Google+ Help item 'Moderate a Community', [https://3support.google.com/plus/answer/6320413?hl=en-GB&ref\\_topic=6320361](https://3support.google.com/plus/answer/6320413?hl=en-GB&ref_topic=6320361)

To invite someone to join your community:

1. On your computer, open Google+.
2. Click Menu item 'Communities'.
3. Click the community to which you want to invite someone.
4. At the top left, click the Invite people symbol.
5. Click 'Invite people on Google+' (figure 03).
6. Choose who you want to invite.
7. Click 'Next'.
8. Enter a message.
9. Click 'Post'

### **Use a link to invite others to your community**

You can also invite someone to join your community using a link. Only owners and moderators can create, access or change an invitation link. Anyone with the link can join the community, as long as an owner or moderator hasn't turned off the link or created a new one. If you use Google+ at work or at school and have turned on domain restriction for your community, invitation links will only work for people within your organisation. If you've been banned from a community, you can't join the community using an invitation link.

1. On your computer, open Google+.
2. Click Menu item 'Communities'.
3. Click the community to which you want to invite someone.
4. At the top left, click the Invite people symbol and choose 'Invite people with a link' (figure 03).
5. Turn on 'Allow invitations via a link'.
6. You'll see a link to share below. To copy the link, click 'Copy'.
7. To turn off or create a new invite link:
8. Follow steps 1-3 above.
9. Turn off 'Allow Invites by link'.
10. When you turn on 'Allow Invites by link' again, a new link will be created.

As the creator of the Google+ community, you are the owner of it. Owners can assign other members as owners and moderators, both of whom will have more privileges than regular members. Typically, you will want your co-instructors and/or select students to be moderators. You may also step down as the owner and leave ownership to someone else. This is handy if you want to hand over the course to a colleague. You can read more about what owners and moderators can do in the Google+ Help item 'Moderate a community' (see previous footnote).

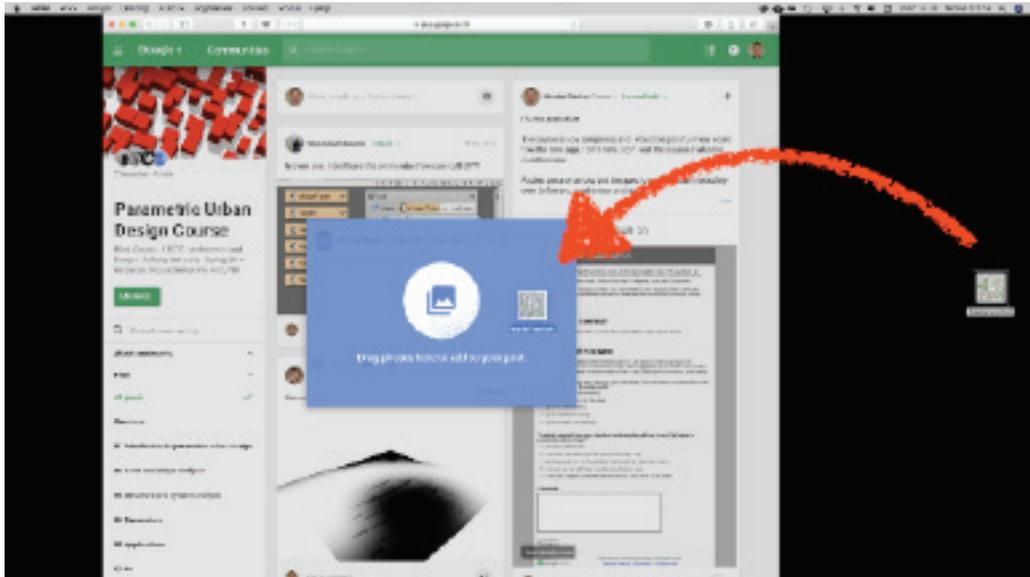


Figure 5: Adding images to posts and comments is a matter of simply dragging and dropping.

## Using your community

This section explains two important aspects of using your Google+ community. The first reason why Google+ is a very efficient tool for course communication and sharing is that it is very easy to add content. The second reason is that it is just as easy to interact with existing content and other users.

### Adding Content to posts

Text may be either written directly in Google+ posts or copied/pasted from existing sources. On a computer, images can be simply dragged and dropped (figure 05), and on a smart-phone/tablet they can be selected from the image library with a few taps. This makes it very fast to share images from your harddrive, browser, image library or other sources. Therefore you are likely to find yourself posting more frequently. You may also find yourself posting while away from your computer, because of the ease of use of the smartphone app.

### Reading and responding to posts from others

In your Google+ settings, you can customise the notification settings for both your computer and your smart-phone/tablet. This enables you to get just the kind of notifications that you want on either type of device. You may for instance get instant notifications on your phone whenever students post something on Google+ (figure 04). As it is possible to use 'mentions' in Google+ the same way you can on other social media platforms, you may also restrict notifications to posts in which you have been mentioned.

**TIP:** In flipped classroom courses, students generally value swift responds from their instructors between classes. While it is of course entirely up to you, to which extent you will allow yourself to be interrupted by students, many requests may typically be responded to quickly during the little breaks that most people have during a work-day. This may save a lot of student frustration as well as class time.

# 5<sup>th</sup> Case: Modelling abstract thinking through videos

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**Teacher:** Assistant Professor Thomas Bøgholm  
**Course:** Object-Oriented Programming, 2<sup>nd</sup> semester

## Background and Theory

Object-oriented programming is a mandatory course that is part of the first year of the undergraduate degree programmes in Computer Science and in Software. Courses that introduce students to object-oriented programming are part of the usual curriculum of undergraduate degrees of this kind across the globe. At AAU, the course fits in particularly well with the project theme of the second semester. A major learning goal of the project is that students become able to write a substantial program in an object-oriented programming language as part of the solution to the problem of the project. The students have previous experience with programming from a course on imperative programming given at the first semester, but this is their first exposure to the object-oriented programming paradigm.

My own experience with the course Object-oriented programming is based on having taught the course in 2016 and 2017. An important aspect of any programming course is that students learn to master the skill of writing programs; this involves what is in pedagogical parlance known as functional and procedural knowledge (in programming, the words “functional” and “procedural” mean something completely different!).

One of the advantages of object-oriented programming is that it can facilitate the construction of large programs. However, in a course setting it is difficult to find the time to write programs beyond a certain size. I have therefore introduced a notion of week assignments, for which students each develop one large program through several smaller assignments spread across several weeks.

Moreover, classes are now so large (with more than 200 students) that it becomes unrealistic to provide students with individual feedback that will be of use to them; when there is little time for individual dialogue it becomes hard to get a good understanding of the student’s line of reasoning and to suggest a better approach, when this is called for. What is more, the approach taken to find a solution is just as important (in fact more important) than the solution itself: The road to the goal matters as much as the goal. Finally, and importantly, videos enable students to watch a presentation as often as they want to.

The course itself consisted of 15 sessions that all shared the same structure, except for the last two: Each session started with a walkthrough of a few of the harder exercises, chosen by the students, or in some cases, the more important exercises, chosen by me. This was done through live coding and explanation. The rest of the lecture consisted of a 90-minute lecture involving interactive programming, where I would develop small programs during the lecture in demonstration of core subjects, and a two-hour problem solving session that involved a collection of small programming exercises. The programming exercises were carried out in the group rooms while the teaching assistants and I would visit the students in turn.

The last two sessions were spent on a large assignment used as a base for the examination. The students were given eight days after receiving the assignment, allowing for two full sessions with help from both teaching

assistants and me, around four hours each. Moreover, I would have a collection of weekly programming assignments of a somewhat larger extent. Weekly assignment was presented at the end of the lecture. I kept this structure in its most recent version.

## The Intervention: supplementary solution videos

I was inspired to create videos from attending the adjunktprædagogikum, which had a workshop about flipped and blended teaching. The idea in my intervention was not to flip the course but to address the issues related to the problem solving that takes place in programming assignment.

My approach has been to record solution videos for the weekly assignments as well as for the more challenging exercises posed in the problem sets for each session. Moreover, I have made video presentations of some of the harder topics covered in the course. These latter presentations were meant as supplements to the lectures covering the same material.

My videos about solutions to assignments were meant to sum up my general observations about the solutions that I had seen. As part of the videos I demonstrated how I would approach this particular assignment, using the program environment that students would use.

The videos were screencasts that I recorded and then edited the videos using Camtasia; this was a tool that could be used for the entire process and as such, it was the right choice for me at the time. One disadvantage of video-based tools such as Camtasia is that it becomes harder to return to an earlier stage of the program development and re-visit older versions of the code that is being developed; this must be handled by the programming environment itself.

I made the videos available via YouTube and shared the YouTube links in the form of embeddings into the Moodle course page. Figure 1 shows a frame from one of my videos.

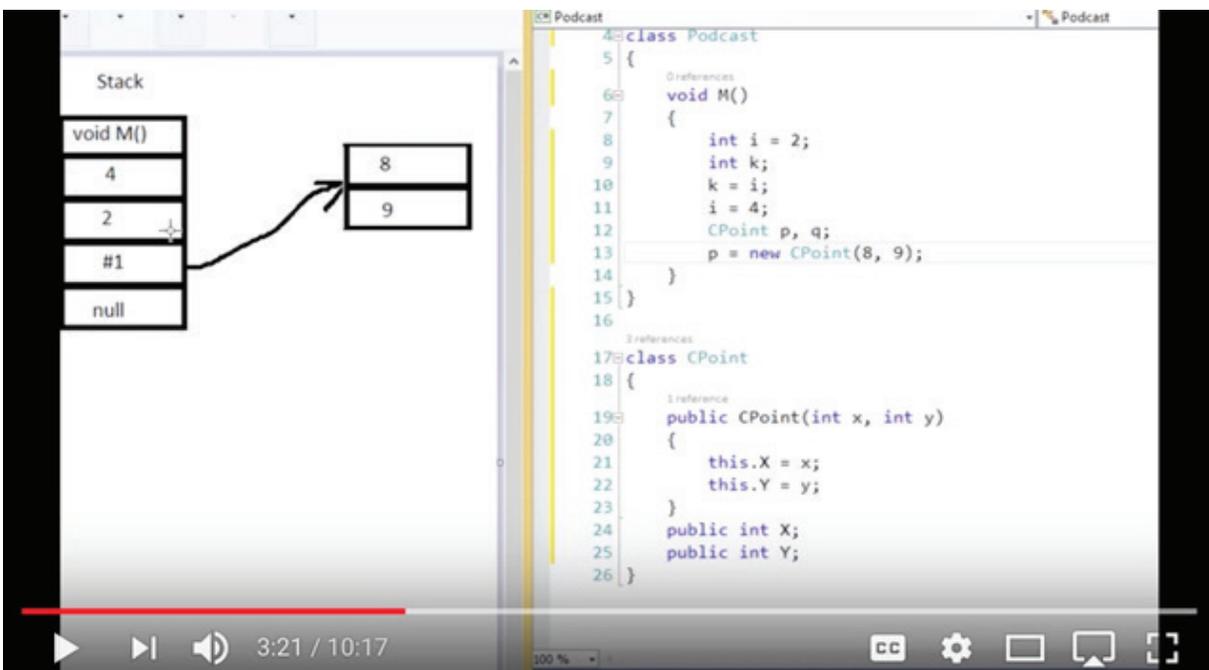


Figure 1

# My reflections

Summing up, the most important lessons I have learned are

- My experience with the videos has been a mixed one. I have learned a lot about making videos in a teaching setting, both from a technical and from a pedagogical perspective. The comments I have had about my teaching have been predominantly positive.

- On the other hand, I discovered that many students did not watch the videos. Some would watch the first segment but not the ones that followed. One response to inquiry was that watching the video would be done at a later stage, in preparing for the exam. Many still preferred to have individual, personal comments from me about their solutions to assignments, even though I would always point out that my comments have to be very brief and that there is a general take-home message that I have tried to get across in the videos, because very many solutions exhibit similar characteristics. On the other hand, students later told me that they had changed their mind and now found that the video solutions were valuable – the individual comments were by necessity short and could not be in-depth. My initial conclusion is, that the individual comments encourage students; it feels nice when their assignments are actually evaluated, and to receive unique feedback. However, as the feedback must be brief, and the assignment large, the use is somewhat negligible, compared to video solutions, which unfortunately requires time and effort for the students to watch.

- I am currently thinking about introducing video solutions developed as live video, streamed to students who can ask questions via a live chat as they watch the stream. This form of interaction with the creator of live streamed video is already available through services such as Twitch, Youtube, and Facebook. This would be a continuation of my practice where I would develop a program and do the actual programming as part of the lecture and receive questions as I was doing this. By using live recordings, the streamed video content can then be edited and uploaded in the form of solution videos. The advantage of this would be that the video content is now directly guided by the interaction with the students.

## Theoretical underpinnings on selected key concepts from this intervention

### *The role of feedback in student learning*

Assessment feedback is an important part of students' learning experiences. Mory (2003) outlines four areas where feedback supports learning. Firstly, feedback acts as an incentive for increasing response rate and accuracy. Second, feedback is a reinforcer that automatically connects responses to prior stimuli (focused on correct responses). Third, feedback is a type of information that learners can use to validate or change a previous response. Lastly, feedback provides scaffolds to help students construct internal schemata and analyze their learning processes. Similarly, Gibbs & Simpson (2004) outline six key drivers where feedback positively influences student performance. These are released when feedback is: (1) sufficient in frequency and detail; (2) focused on students' performance, on their learning, and on their actions, rather than on the students themselves; (3) timely in that it is received while it still matters and in time for application; (4) appropriate to the aim of the assessment and its criteria; (5) appropriate in relation to students' conception of learning, of knowledge and of the discourse of the discipline; (6) is attended to and acted upon.

There is a growing interest in widening the text-based medium for providing feedback with new, technology supported feedback measures in higher education, such as audio and video feedback. In a study comparing student

preferences for three forms of feedback, i.e. written, audio- and video-based, McCarthy (2015) found that video feedback was by far the most positively received, followed by the written feedback and lastly the audio feedback. However, it appeared that students tended not to view the audio and video models as 'official' feedback, thus emphasizing the need to clearly explain to students that feedback can come in a variety of different formats and media.

### *Video-based feedback on student assignments*

Video-based feedback has been found as a viable alternative to text-based feedback. Henderson & Phillips (2015) show that especially individual video-based feedback seems to be highly appreciated by students in ways that conforms with the above mentioned research on feedback for learning. Firstly, students find it specific to them as individuals, and personal to them, thereby valorizing their identity and effort. In the same vein, video-feedback is seen as a personal response from the lecturer, which is interpreted as sincerity. Similarly, affordances of the media, including the rich visual cues, promote a perception of the feedback as clear, detailed and unambiguous. Finally, individualized video-feedback appears to promote student reflections on their task performance and processes, as well as contributing constructively to devising future strategies for learning.

It appears however that students need to gain some experience with valuing video-feedback when it is not individual, but more generic, centered on the assignment itself: which typical errors students have made, and how they could be avoided. West & Turner (2016) suggest that general feedback can be rendered more specific by linking it more directly to formal assessment criteria, i.e. marking and grading, by complementing spoken feedback with screen captures showing how marks are allocated. In other words, capitalizing on the possibility to provide greater depth of explanatory feedback might help motivating students to engage with and learn from feedback focused on task performance.

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- West, J., & Turner, W. (2016). Enhancing the assessment experience: improving student perceptions, engagement and understanding using online video feedback. *Innovations in Education and Teaching International*, 53(4), 400-410.

# Talking about Practice

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## MODELLING ABSTRACT THINKING THROUGH VIDEOS



Available at: <https://www.youtube.com/watch?v=uDjjUcoFNF4>

Watch this video of Assistant Professor Thomas Bøgholm where he talks about his experience flipping his teaching practices by using recorded and narrated screencasts.

# Tools to implement this innovation

## How to make a screen recording

The video content in the podcasts consists of screen recordings. There are at least two ways of making screencasts of this kind. A simple and inexpensive approach to recording screen content as well as webcam content is to use Screencast-O-Matic, which is both an app and a web service available at <https://screencast-o-matic.com>.

To get started, visit : <https://screencast-o-matic.com>. Figure 1 is what you will then see.

If you use the free service (choose Start recording for free), you can record videos of up to 15 minutes each.

There are tutorials for Screencast-O-Matic at <https://help.screencast-o-matic.com>. The essential starting point is the introduction to the recorder (<https://help.screencast-o-matic.com/channels/cFhrr8AuY#navback>); you should watch this first.

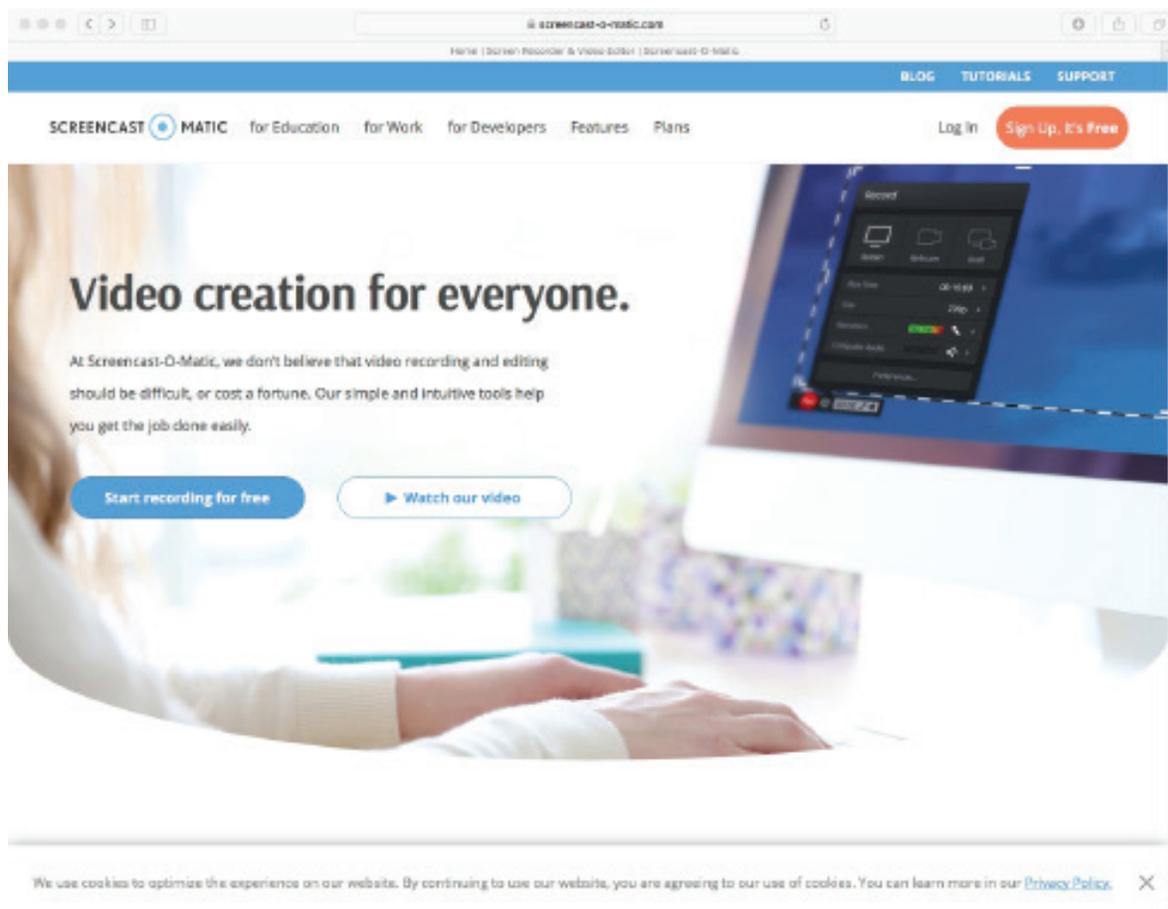


Figure 1

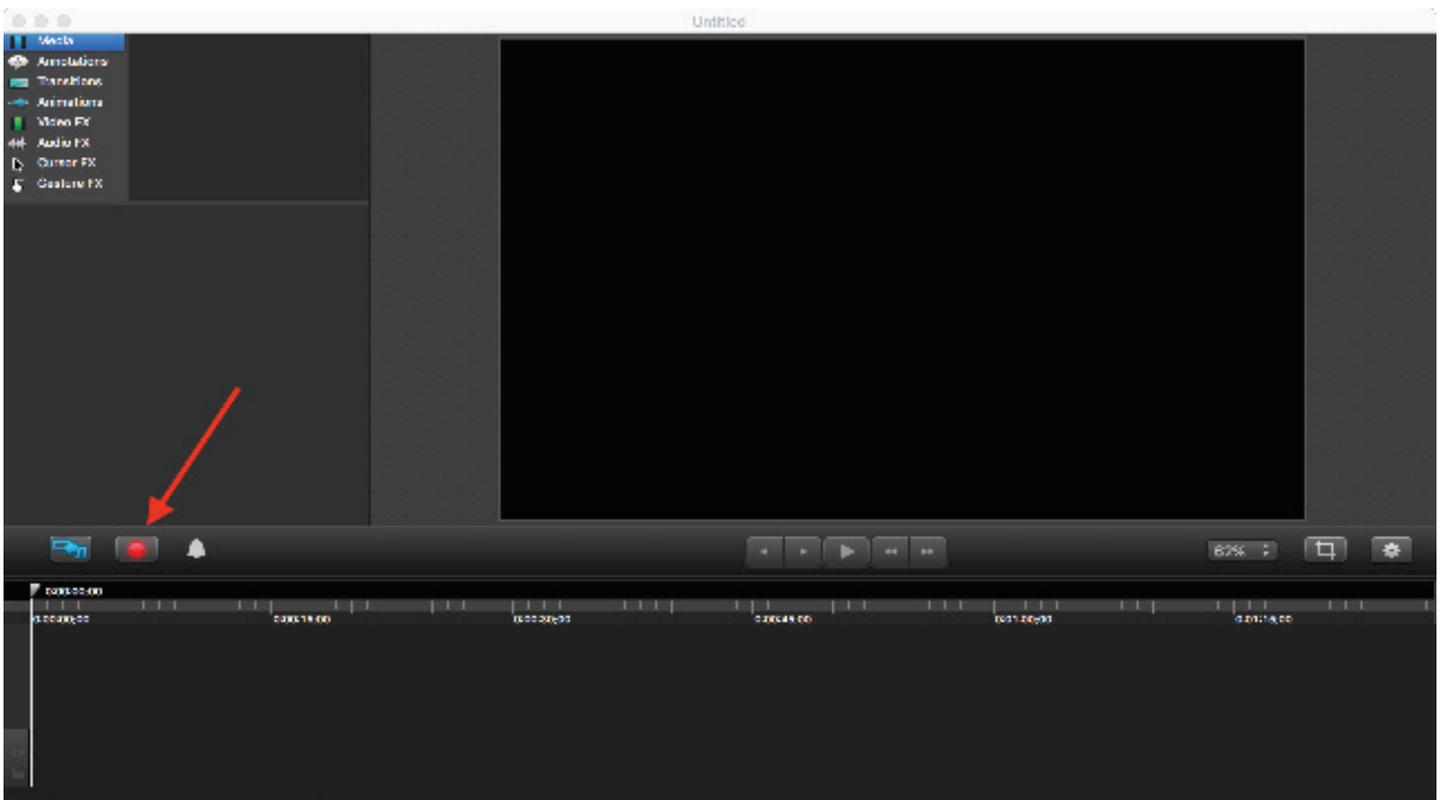
Another alternative is Camtasia from TechSmith; see <https://www.techsmith.com/video-editor.html>. Camtasia is a screen recorder and video editor and is available for Windows and macOS.

Camtasia is neither free nor inexpensive. A single-user licence is \$249.00. On the other hand, Camtasia can be used both for recording screen content and for subsequent editing of any kind of video content, so if you are really keen on taking up podcasting, it may be a good choice for you.

Recordings in Camtasia are organized as projects. When you start Camtasia, the application opens a new project for you. You can then choose to open an existing project, if you are going to continue editing and recording within it.

Let us instead assume that you would like to work on a new project.

To start recording content, select the red Record button, as shown on Figure 2, below.



*Figure 2*

To make a screen recording, choose Full Screen. After that, you can choose to record the content of the entire display or select a custom region that is to be recorded. The latter is useful, if you only want to record part of the screen such as an editor window.

You can then choose to also use the camera for the recording; this will be useful if you also want to show a small window of you talking. Finally you can select the audio input source that you would like to record.

When you are ready, press the red rec button. Camtasia will now record whatever happens on your screen and whatever audio appears in your chosen audio source.

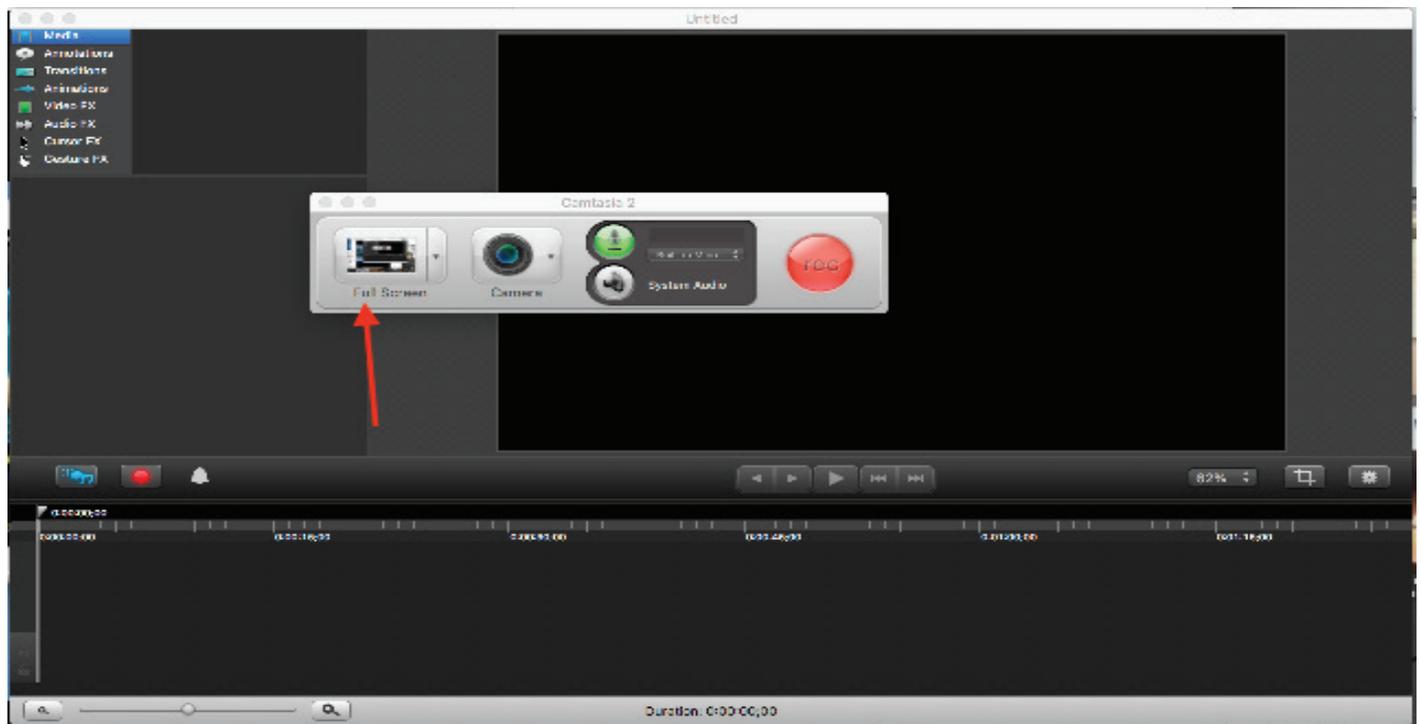


Figure 3

When you are done recording the screen, press the stop button that has appeared instead of the rec button, as shown in the Figure below.



Figure 4



# 6<sup>th</sup> Case: The Flipped PBL Classroom

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**Teacher:** Associate Professor Dorina Gnaur  
**Course:** Change and Project Management, 5th semester

## Background and Theory

This course is part of a BA-elective program in Organization and Leadership at the Department of International Business Communication (SIV). On the 5th semester, BA-students can choose among three different elective programs. The elective courses are open to students from all BA programs within SIV as well as to students from selected BA-programs within the Faculty of Humanities. The Change and Project Management course is further divided into a Change Management and a Project Management part, each comprising 8 sessions of two-hour-classes. A Flipped Classroom approach was applied in the Change Management part and covered two separate groups of about 30 students in each class. Change Management is multi-disciplinary, including a wide spectrum of input within the field of organizational studies, for instance business development, but also how to manage change processes and people issues. Students will have to cover large amounts of theory and methods with the aim of applying them to concrete cases and achieve skills and competences at the level of a change agent in organizations. In the last part of the semester, students form project groups and seek out real life problems in organizations as the point of departure for their PBL projects, for which they are assessed orally at the end of the term. Teaching to that aim, in such a brief span of time, can be fairly challenging.

Due to the complexity of addressing different types of content and methodological knowledge, the challenge was how to reduce the pressure on presenting different content in ways that facilitate understanding, so that we also could afford time on working with and applying new content. The purpose of the course was to prepare students for undertaking the role of a change agent in different contexts, the main focus should be on functional knowledge, i.e. the ability to make knowledge work in practice and evaluate the outcomes. There are three types of knowledge that go before this level. One the one hand, students need to know what is the content of the subject and thus achieve declarative knowledge; as well as how to apply certain methods, models, theories, which is known as procedural knowledge. On the other hand, students need to develop the ability to know in which situations and under which conditions they should apply which types of knowledge and procedures, and this is called conditional knowledge.

After having run the course for two consecutive years, trying various techniques of active learning, I was still not able to reduce the content pressure, and students gave at times contradictory feedback (during midterm evaluations in oral discussions). The students clearly wanted to maintain a strong emphasis on the content and methods, as it was difficult to grasp otherwise, and have more space for hands-on, practical activities where they could try out and assess various models, methods and tools in class.

I asked them if it would help to have some of the content and methods explained on small video clips and they welcomed the idea.

### **The Intervention: producing lecture video podcasts**

The idea in this intervention was to attend to teaching content knowledge differently. I decided to transform all

lectures into podcasts. For each of the eight scheduled classes I prepared three to four podcasts, most of them 10-15 min. long. This approach was used to spend more time in class discussing ideas. However, the video podcasts were not the only material supplied to the students. They were given three material options: besides references to the course manual and selected specialized articles, they could also access the lecture content via the PowerPoint slides that were used for the podcasts, and then of course the podcasts, where the slides were used as a background for podcast lecturing. The recordings featured me, in person, explaining core concepts, mostly pointing at PPT slides, or zooming in directly on the slide when focusing on details. Thus, the students could choose based on their preferred learning styles/preferences/needs. While the students could choose what resources they preferred a recommendation was made for them to start by watching the podcast first before reading. It turned out that some students utilized more of some resources than others at various points in time. Student evaluations showed that the podcasts were often used as an entry to the topics, and sometimes revisited for specific explanations; eventually, students relied on the PPT slides for recap, not least as a resource during their PBL project.

As already mentioned, the students were directly involved in this design by giving their feedback about their learning needs and learning experiences three times during the semester, initial, midway and after their examination. Already before semester start, I prepared some initial video clips on Moodle explaining the principle of Flipped Classroom and suggesting that I would apply this didactic principle in the course, i.e. storing the lecture content digitally and saving the class time for practical exercises, case work and critical discussions. I made sure to insist on importance of coming to class in order for real learning to happen, as mere content knowledge wouldn't get them very far on the learning taxonomy ladder (I referred to the SOLO taxonomy). I also produced the introductory lecture as three podcasts, providing the main theoretical and methodological framework for the study of change management. At the first appointed class, I told the new students about previous experiences with this course, and the feedback I had received on perhaps using video to communicate knowledge content, and I asked their opinion. They were positive, and liked the idea. Some of them had even tried Flipped Classroom on their exchange term at foreign universities and were extremely positive. They asked about the workload, and I explained that the podcasts should make it easier to look for in depth knowledge in the written resources. They appreciated the idea of flexible access to preferred resources. This initial feedback motivated me for continuing the production of podcasts for the remaining lectures. I produced 27 podcasts in all, the ones for the first 4 lectures were already made, the rest was developed on a week to week basis.

In addition to this initial feedback, we also had midway evaluations in the form of written surveys followed by a discussion in class; as well as final evaluation in the form of a written survey. Here I could get a sense of the patterns of watching the podcasts in relation to the rest of the resources and to class work. The discussion revealed a certain concern with students getting a bit more laid back with regard to reading texts, as they would access knowledge more easily by watching the podcasts. Part of the feedback came also from the metadata available on a Youtube channel where I published my podcasts, that is information about how many students had accessed the different resources (I set the settings on the Youtube channel to 'unlisted', so that I could embed the videos from youtube into the Moodle course page, without making them public). The pattern here shows that the first part of the podcasts have been displayed most times, with a slight decrease in the middle, and more markedly towards the end of the course, probably as the course now was ending and students knew where to find the content knowledge if needed.

During the face-to-face class time, work started with a 30-45 min discussion on any difficult conceptual issues. I would first ask if the students had any questions or stuff they found difficult. Then I would ask questions as to the forces and limitations of specific approaches and invite them to make qualified guesses as per which situations these approaches might apply to and which not. In this way, students would train their conditional knowledge. This discussion was then followed up by practical exercises with the model, mostly from the manual, as well as cases, either from the course manual or from other sources or the media, e.g. cases with more or less successful changes in the local geographic or national context. The cases would lead to discussions as per the relevance and validity of the methods employed, especially as they would lead to different results among the groups of students.

We also made recurrent links to types of problem formulations that the cases we worked on might generate, with regard to the upcoming project work. In this way, students had a feeling of getting ready to go out and seek for relevant problems to work on in their projects.

Student evaluations discussed the effectiveness of this approach and student needs, and overall student feedback was very positive. The students found that watching the podcasts was much easier as an entry to a new subject area. Student feedback was that once they watched the podcasts they felt they had gained an overview of what to look for if they needed more in depth information. Typically, the students went back to more detailed information when they were working in the project work. Eventually, students would seek more in depth information by consulting the book and the articles. The PPT slides were consulted as a quick review of specific items. This proved particularly useful during the project period, particularly the brainstorm, to seek inspiration as per which approaches were available and suitable to their inquiry (source: partly from the final evaluation and partly from asking the 10 groups of students that I supervised if they found the podcasts useful during project work).

During class time the impression was that the level of discussion was much higher. Students felt more confident to express themselves and to challenge and criticize the exposed content (theories, methods, models, tools) The midterm evaluation showed that about a third of the in all 60 students had watched some of the videos, or parts of the videos several times, which also corresponds with the Youtube metadata showing a considerably larger number of displays than the number of students. This can be seen on the Youtube CM\_SIV channel analytics, yet only to illustrate the tendency. The number of displays extends beyond the particular semester, as the channel was used for the consecutive semesters as background resource, by my colleague who taught the course two times after me, although not as a Flipped Classroom design, and linked to the Youtube channel from the course side on Moodle.

One additional data source for the Flipped Classroom intervention came from one of the project groups following the course, that chose to focus on change processes in University pedagogy, studying the intervention using podcasts and flipped classroom pedagogy. This group also conducted a survey among their co-students and encouraged a chat on the class Facebook page on the topic. The findings from this student investigation showed that all students liked this approach but they also felt it was a higher workload on them. Over time students also got less enthusiastic about the podcasts, which is confirmed by the Youtube analytics. Also in their case, students said that they would start by watching the podcast then go through the PowerPoint. Typically, they would go to a specific slide to read more details. But it was only during the project work that they would go back to literature in their manuals.

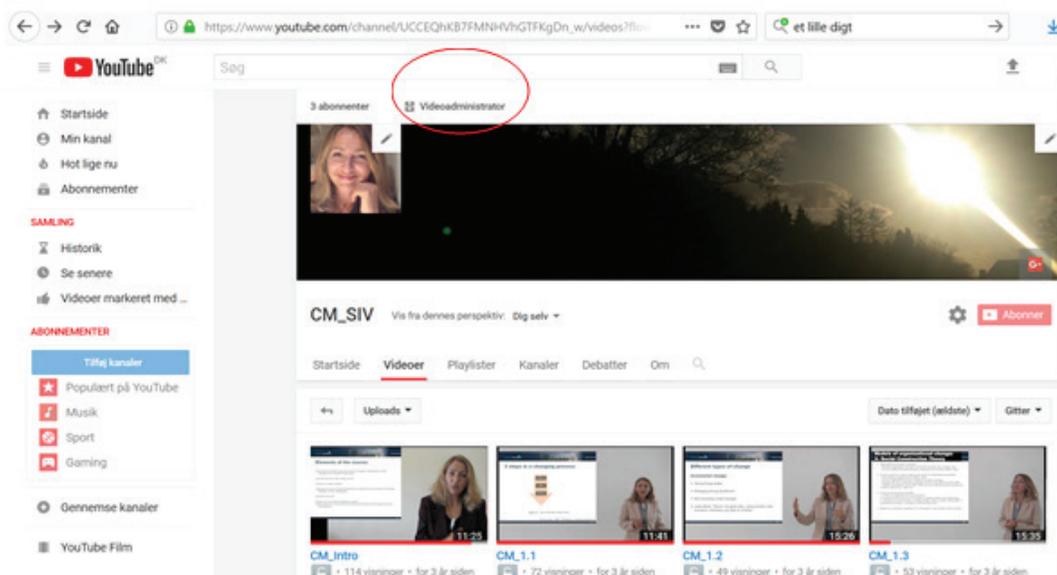


Figure 1. Data analytics for the CM\_SIV channel on YouTube

The students explained also that they occasionally would go back to the podcasts during their project work, to refresh their understanding of certain topics quickly. In this way, the podcasts and the related PPT slides were used as reference points during project work, side by side with the manual and the other resources, and were in this sense being used in a very active way.

I've often wondered whether I would use the existing podcast series – would I teach the course again. I would definitely use the Flipped Class approach, but I might feel tempted to ask the students to take turns in exposing at least some of the content knowledge as podcasts, to replace parts of my production.

## **Theoretical underpinnings on selected key concepts from this intervention**

### *Flipped Classroom (FC)*

FC has been described as the kind of teaching events that would traditionally take place inside classrooms and now take place outside classroom and the other way around (Lage, Platt & Treglia, 2000; McNally et al., 2017). An important aspect is that a flipped classroom is typically associated with blended learning approaches, this means that the use of technology is blended with more traditional teaching approaches and often involves computer supported work outside the classroom while group based activities characterize in the classroom activities (Bishop & Verleger, 2013). McNally et al. (2017) explain that a flipped classroom needs to include “a) an opportunity for students to gain exposure to content prior to class (e.g., recorded lectures), b) an incentive for students to prepare for class (e.g., pre-class quizzes), c) a mechanism to assess student understanding (e.g., graded pre-class quizzes), and d) in-class activities that focus on higher level cognitive activities involving active learning, peer learning and/or problem-solving” (p.2).

### *Flipped classroom and learning outcomes*

The research community points out that many studies have focused on student experiences and satisfaction but not necessarily on learning outcomes following the implementation of a FC approach. Blair, Maharaj and Primus (2016) found that using a confidence level of 95 %, there was no evidence of any significant impact of the flipped format on student performance but they reported increased levels of motivation for both teacher and students and also pointed out that this format of teaching results in an increase of resources that are made available to students that come in different formats and appeal to different learning styles. Generally, the reported learning benefits include an increase of teacher-student interactions, student-paced learning, in-time feedback, higher engagement levels of students, homework that is meaningful and that students can better connect with (Goodwin & Miller 2013).

### *Autonomous learning and increased motivation in Flipped Classrooms*

The FC approach aims at activating students to become more autonomous and self-motivated learners. Suo and Hou (2017) stress that teachers need to employ motivational strategies to bring out the benefits of the flipped classroom otherwise students may fail to complete tasks and lose their desire to participate in continued learning activities. Motivational approaches could follow the four-step approach: challenge, curiosity, control and imagination. Presenting challenges to students can be highly effective in increasing intrinsic motivation, however challenges should be achievable. Curiosity is about creating the conditions for wanting to uncover unknown factors and this can capture students' attention. Curiosity may also include making experiences that involve the senses especially if this creates situations where unexpected aspects can be experienced. This is something the teacher can also create and design for. Further, students tend to control their learning more actively if they are given more choices. Finally, imagination is providing students with opportunities to include their emotions, but such experience need to be made relevant to students' needs and experiences. Imagination should allow that students apply things they have

just learned to new situations to practice and apply competencies. Autonomous leaning is a significant aspect of the success in using FC approaches and depends on how much students can be motivated and stimulated.

## References

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# Talking about Practice

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## THE FLIPPED PBL CLASSROOM



Available at: <https://www.youtube.com/watch?v=kAZwWUeDs1M>

Watch this video of Associate Professor Dorina Gnaur where she talks about her experience flipping her teaching approach by integrating video-podcasts.

# Tools to implement this innovation

## How to store your video productions using YouTube and embed videos in Moodle

YouTube is an easily accessible space for storing your video clips. Set up an account and customize settings to suit your preferences. You can choose to have your videos open or private. Choose 'Videoadministratør'

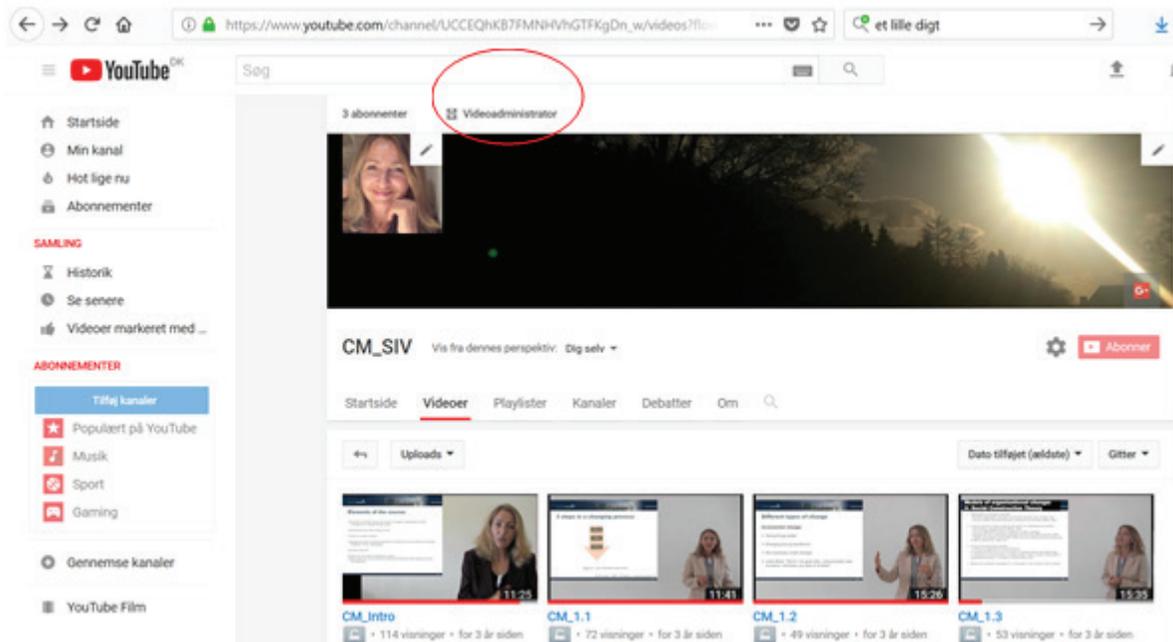


Figure 1

Then select any video and click: 'Handler' / 'Actions'; and then choose 'Adgang' / 'Access': whether 'Offentlig' / 'Public'; 'Skjult' / 'Hidden'; or 'Privat' / 'Private'.

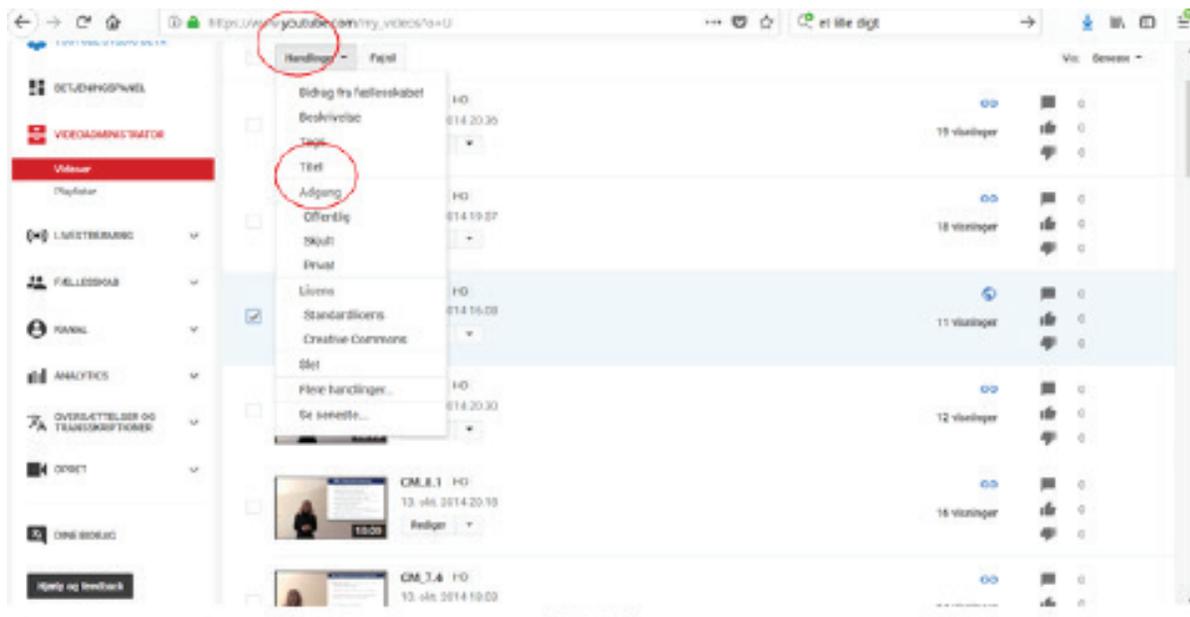


Figure 2

# How to embed a video from YouTube into Moodle

Open your course page in Moodle and turn the editing on. Choose Edit topic:

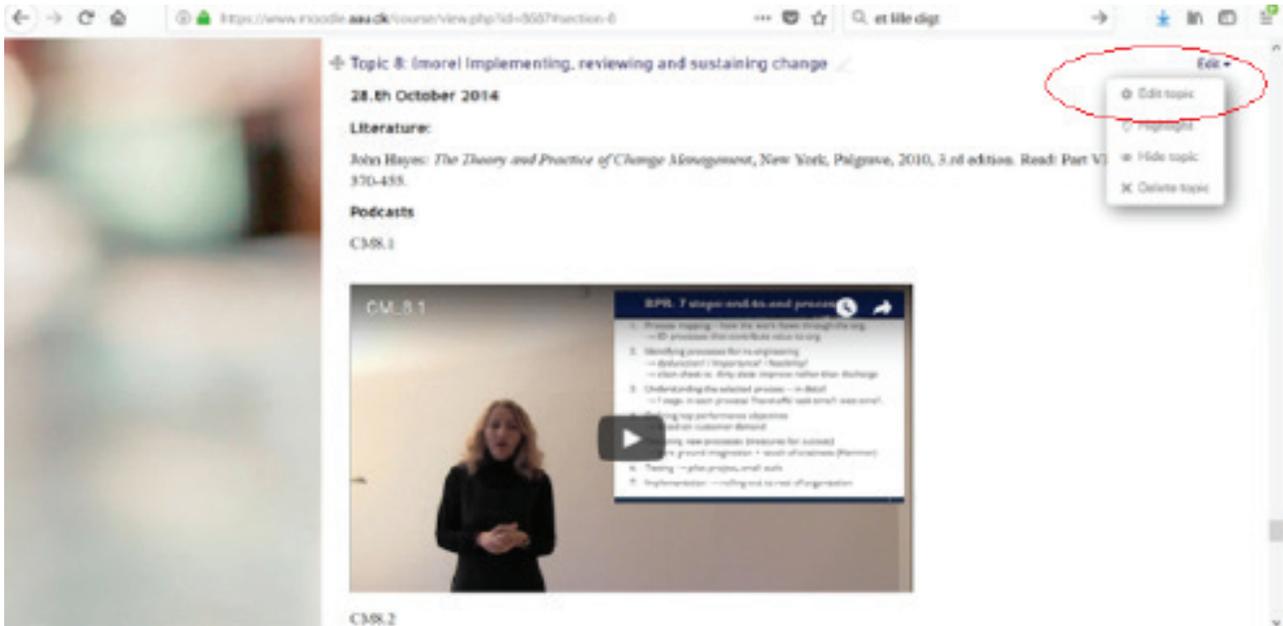


Figure 3

Choose the HTML editor by clicking on the left-most button: 'Show more buttons'; and then select the HTML editor: < > button:

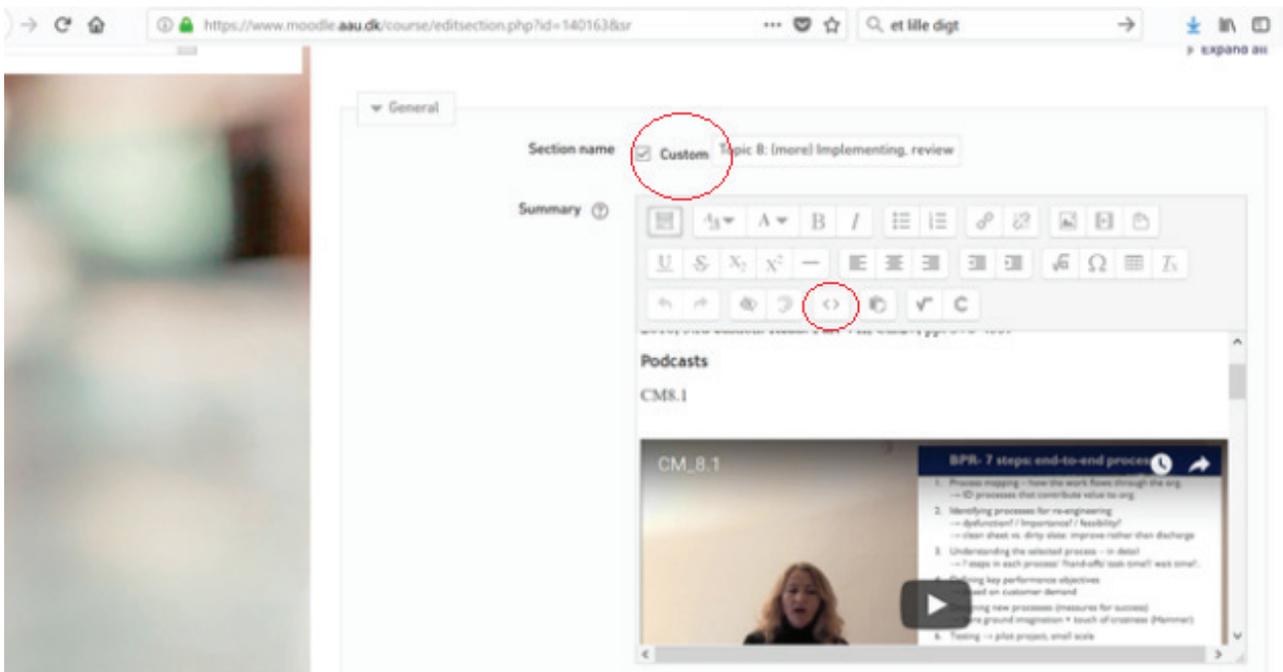
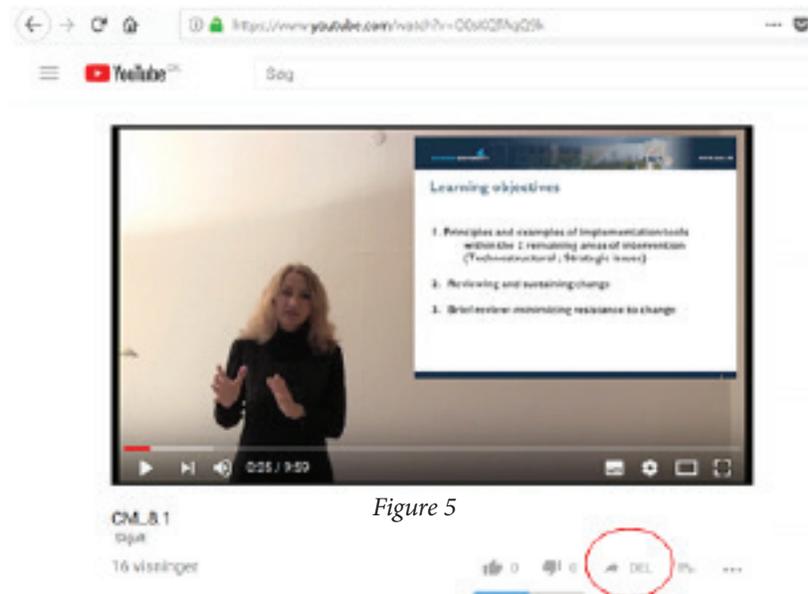


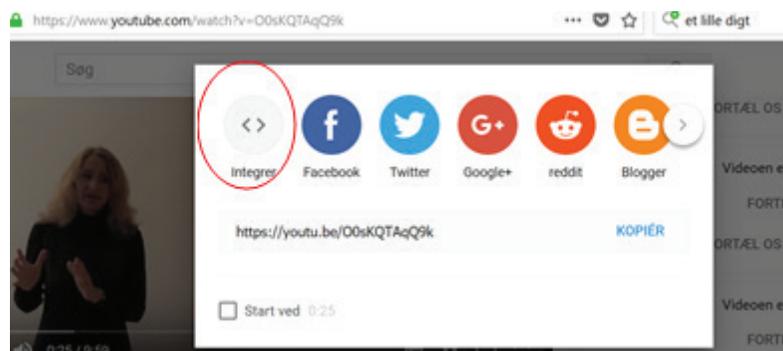
Figure 4

Selecting the 'embed' code for your video from YouTube , then find your video on YouTube and select: 'Del'/'Share'.

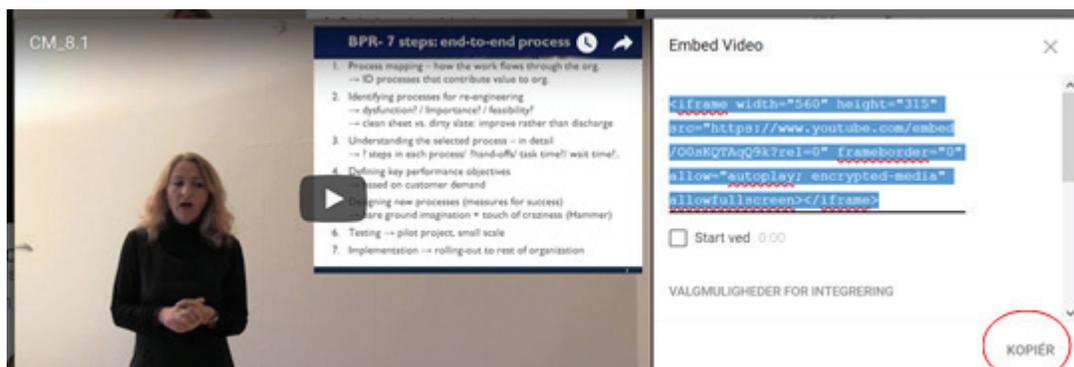
Now find your video on YouTube and select: 'Del'/'Share'.



Select the HTML button, 'Integrer'/'Embed': < >



Then select 'Kopiér'/'Copy'.



Back to Moodle

Now, you make a line shift in the open editing box in Moodle (in HTML-mode), and paste the embed code from YouTube:

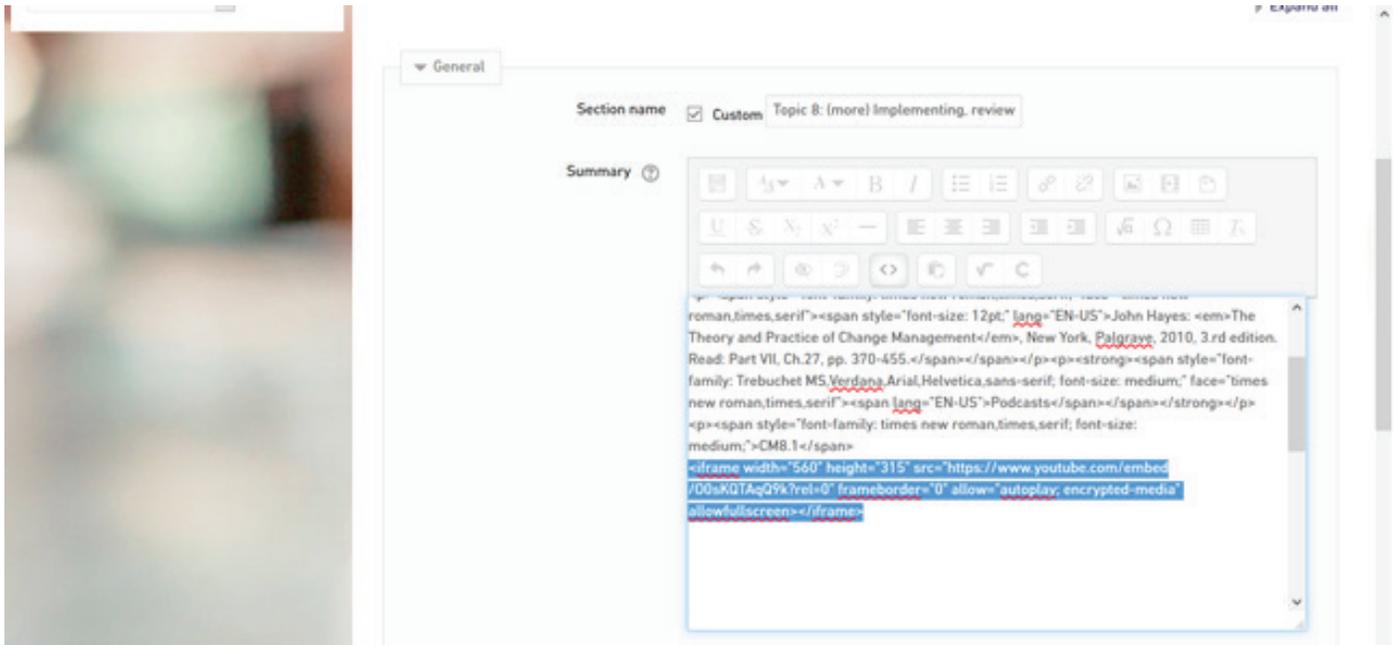


Figure 8

Finally, you press 'Save changes' – and your video is ready to play in Moodle!



Figure 9

Remember, you can only make minor adjustments in normal (not HTML) editing mode in order to insert or change text, set in extra space, etc.