INSPIRATIONAL SES TEACHERS

AALBORG UNIVERSITET

A REPORT PREPARED BY KATHRIN OTREL-CASS FOR THE SCHOOL BOARD OF SCIENCE AND ENGINEERING AT AALBORG UNIVERSITY

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Table of contents

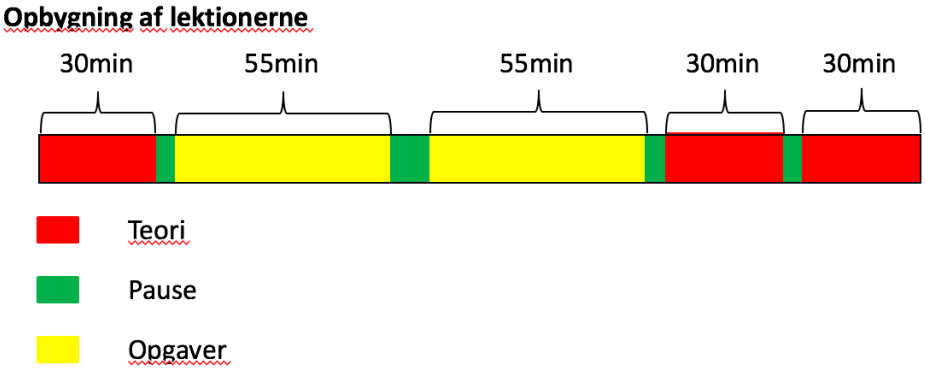
CASE 1	FLIPPED COURSE STRUCTURE
TEACHER	ASSOCIATE PROFESSOR HENRIK SØRENSEN
COURSE	TERMISKE GRUNDFAG (STRØMNINGSMEKANIK– 4 FORELÆSNINGER/LECTURES, 3RD SEMESTER

THE CHALLENGE

The traditional format of giving two blocks of lectures followed by tasks students need to do in their groups means that students do not necessarily hear about issues that other groups experienced and it breaks also the continuity of following up on theoretical issues since teacher and students have to wait until the next lecture. Making connections between theory and application can be challenging if there is not enough time to try out new ideas and discuss things.

IMPLEMENTATION

This innovation is about changing the sequence of theory input, active learning and discussion/feedback. The teaching starts in the previous lesson that introduces the theory; this is followed up by posting teaching materials the students need to read ahead of the lecture. The lecture itself starts with a short, sharp presentation of the key concepts that are necessary for the solving of tasks. This sequence may take ideally 20 minutes. After a short break, the students are working in their group rooms for two blocks of teaching (2x 45min) with tasks to solve. During this time the teacher and a PhD student visit the groups to help clarify questions. Including the PhD student in this task helps also breaking down barriers by discussing questions with a more experienced peer. Groups also indicate when they need the teacher for specific questions they have by putting a rubbish bin in front of their room. The teacher and PhD student collect the questions and issues that have emerged during this period. During the next phase the teacher is back with the whole class to discuss the questions that puzzled the students, also to share with the whole class what was problematic. This allows also to follow up on things the teacher may not have identified earlier as potentially problematic.



During this period, the teacher also uses a quiz/polling technology called Turning Point. Students are given follow-up questions and can discuss in groups which answer is the correct one before they vote. The last part of the whole class teaching introduces the new theory for the next session. The idea is, that by using quizzes combined with discussions about the different answers, the students become more involved and active with their thinking. This activity gives students the chance to discuss the key concepts in small groups before answering the questions in the quiz.

THE RESULTS

This approach of reorganizing the sequence of teaching gives the teacher better insight into conceptual issues the students may be facing. It allows the teacher also to make sure that particular threshold concepts that are crucial to know in this field are being discussed with everyone. Being able to come back to class to discuss theory and application means that feedback on active learning is immediate and not temporarily delayed. Support activities such as the use of the quiz where ideas can be discussed is another supportive approach to transform a 'lecture' into a time for active learning.

COMMENTS ON THE APPROACH

Using this approach does not mean that it is the only successful way of organizing lecture content. Well done 2x45min blocks can result also in very good teaching.

This example was from a course that was co-taught with other teachers. It is advisable that students have enough time with each teacher to get the most out of this interaction. In this case, it seemed that good ratio was to organize teaching assignments of no less than 5 sessions per teacher.

Expecting that students read text material before a lecture can be a risky. Preparing exercises and expecting that students have sufficient knowledge about key theories and concepts could easily result in them finding the quality of the lecture to be poor because they do not understand the necessary information to solve the exercises.

If students not are used to different teaching styles it is very important to discuss the details of new approaches and the individual expectations at the start of the semester.

Making changes to the teaching style takes time and patience. An approach students appreciate one year may be disliked by students in the following year. In some cases, students may be more critical

when they are expected to take on more responsibility for their learning. New teaching approaches should be developed in reflection on a teachers' individual style and the subject

A practical suggestion: conducting quizzes takes time and energy and may be best placed close to break time.

RESOURCES

Link to video about this innovation: https://edumedia.dk/media/t/0_wcj913o1

Turning Point https://www.turningtechnologies.com/

Literature on using Turning point:

Johnson, D., & McLeod, S. (2005). Get Answers: Using Student Response Systems to See Students' Thinking. *Learning & Leading with Technology*, *32*(4), 18-23.

KEY CONCEPTS USED IN THIS SUMMARY:

Active learning - students engage in activities, such as reading, writing, discussion, or problem solving that promote analysis, synthesis, and evaluation of class content.

Threshold concepts - term to describe core concepts that once understood, transform perception of a given subject

CASE 2	BUILDING CUSTOMISABLE RESOURCES: PODCASTS FOR TEACHING
TEACHER	ASSOCIATE PROFESSOR KJELD NIELSEN
COURSE	AT LEAST FOUR DIFFERENT EDUCATIONAL PROGRAMMES (VS, CTPP, VT, MOE) BACHELOR AND MASTER

THE CHALLENGE

The motivation to learn how to produce and use podcasts was fourfold:

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

IMPLEMENTATION

The technology used to produce podcasts (videos) is called Office Mix, an extension to Powerpoint. This means that the overall structure and look was familiar and easy to work with. Office Mix is a free extension to PowerPoint (note: works for PC only!!) to turn PowerPoint presentations into interactive online lessons and share them with students.

The first podcast was made on a normal laptop. It didn't take long to learn how to use Office Mix and record a video based on ppt slides. However, one of the powerful tools of Office Mix is to use annotations that are best done using hands-free drawing tools.

In this case two videos using Office Mix were produced. They were based on existing PowerPoint material and fine-tuned. Specifically, that meant less text and utilizing the interactive features in Office Mix, for example being able to draw on the slide to give more emphasis.

This means that existing PowerPoint material had to be 'updated' to be used as a podcast. It helped to prepare a manus or script for each slide.

Podcasting can support principles advocated by several theories of learning, such as the use of authentic materials, informal and lifelong learning, the use of learning objects for the provision of learning materials and just-in-time teaching (Rosell-Aguilar, 2007).

THE RESULTS

The podcasts were introduced to the students to watch in preparation of a lecture. These were combined with short Kahoot quizzes that tested what was presented in the podcast to make the podcast watching even more purposeful.

Preparing the podcasts from existing PowerPoint material gave also an opportunity to review existing teaching material. This resulted that PowerPoint slides are now using primarily illustrations and reduced the fear of making lectures perhaps too predictable if slides were handed out beforehand. 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.

Office Mix gives also information about students' viewing times that are specific to each individual slide and this allows for a refined revision process of podcast elements.

This approach has been also inspirational for other colleagues. At the time of preparing this report there were at least two more colleagues who are experimenting. Sharing experiences, tips and tricks increases not only that the products get better over time but also that the students get used to this style of learning in a more sustained way.

The students really liked this approach of supplementing the teaching with short and concise podcasts and the learning analytics in Office Mix showed also that they watched the podcasts for the duration of time each podcast ran.

COMMENTS ON THE APPROACH

It took a little bit of experimenting and learning but since Office Mix 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.

As a result of the review process the 2nd generation podcast eliminated the welcome slide, and the podcasts were shorter overall, using more annotations or animations.

The research group made the decision to buy the touchscreen, video and audio for recording, meaning also that the technology is available to more than only one teacher.

RESOURCES

A link to an interview with Associate Professor Kjeld Nielsen about why he got interested in producing podcasts https://edumedia.dk/media/t/0_bp3i2bz7

A link to an interview with Associate Professor Kjeld Nielsen about how he uses Office Mix for producing podcasts https://edumedia.dk/media/t/0_gw77ydhg

A link to office Mix: https://mix.office.com/en-us/Home

A link to Office Mix tutorials: https://mix.office.com/gallery/category/how-to

A link to Kahoot, an online quiz https://getkahoot.com/

KEY CONCEPTS USED IN THIS SUMMARY:

Podcast - A podcast is one or more audio or video files that can be played on a number of devices.

Just-in-time teaching (often abbreviated as JiTT) is a pedagogical strategy that uses feedback between classroom activities and work that students do at home or before a lecture, in preparation for when they meet in class with the teacher.

CASE 3	ACTIVE LEARNING THROUGH MOODLE: VIDEO FOR REFLECTION
TEACHER	ASSOCIATE PROFESSOR EVA MARIA PETERSEN
COURSE	ORGANISK KEMI OG MIKROBIOLOGI, BACHELOR 3RD SEMESTER

THE CHALLENGE

The nature of knowledge acquisition in organic chemistry can be very demanding and requires that students actively engage in the application of new knowledge and continue to practice it. The challenge in this course was that in previous years the failing rates were very high. It seemed that by the time students attended their final exams they had forgotten concepts and applications of chemical knowledge they had learned at the start.

IMPLEMENTATION

This innovation involved that the formal assessment scheme was changed, insofar that students had to do a number of in course activities that were graded and contributed to the overall grade. In addition, the teacher added also additional resources. These new additions were:

- An individual task to respond to a teacher task of solving chemical reactions and explaining the mechanisms, filming it and uploading it for the teacher to watch and grade. After handing in the video, the tasks were discussed and solved in the classroom together with all students.
- A group activity, where one group had to find an appropriate chemical reaction in the literature and a second group who had to solve the reaction and explain the mechanism of the reaction. The first group assessed if the assignment was solved correctly.
- Online discussions on a given topic.
- The use of videos from the Internet that supplemented classroom teaching these were posted before/after the classroom teaching.

THE RESULTS

The most convincing result from this intervention was that for the first time for a long time everyone passed the course (with the exception for two students who did not show up) – even though the level of difficulty of the problems in the exam was the same as in the years before. The feedback the teacher received from the students was very positive. The students felt engaged and liked the activities increasing learner engagement. They replied that they were able to see their own progression in learning. It was not conclusive if the online discussions had been of much value but the videos, both students produced and resource videos, were much appreciated. This approach of including a number of assessment tasks throughout the course that include also video allowed the teacher to identify very quickly problematic issues that needed to be discussed in class. This pedagogical approach supported active learning, where students had to demonstrate how they think and work through given problems. Each student received individual and personally posted feedback to their video production. It also

provided students with a resource they could use in preparation for their final exam. However, this hasn't been evaluated during this first round of implementation.

COMMENTS ON THE APPROACH

To help students produce videos easily using their smartphones VILA (vila.aau.dk) produced a podcast to explain step-by-step procedures for Androids and iPhones and how to upload the video to Moodle. The student feedback was that this was very helpful and easy to understand. The first-time preparation of this course was work intensive for the teacher to set up since it took also some time to identify useful video material online and find the appropriate chemical reactions for the individual tasks. However, once having established the organization and resources in Moodle means that in years to come the course needs only the normal revision and updating.

RESOURCES

A link to a video in which Associate Professor Eva Petersen reflects on this teaching innovation using student produced videos https://edumedia.dk/media/t/0_a4kdhfum

A link to the podcast produced by VILA to explain on how to record, transfer and download videos using smartphones https://www.youtube.com/watch?v=gP93518FbU8

Sherer and Shea (2011) have written an interesting article on the benefits of using online videos for higher education teaching. They explain that online videos, very often from YouTube are popular resources used for video-sharing both by faculty and students inside and outside of the classroom. They find that videos can assist university teachers to engage students, bring more energy into classroom discussions, in an effort to achieve defined course learning outcomes.

Sherer, P., & Shea, T. (2011). Using online video to support student learning and engagement. *College Teaching, 59*(2), 56-59.

KEY CONCEPTS USED IN THIS SUMMARY:

Learner engagement - the degree of attention, curiosity, interest, optimism, and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and progress in their education.

Active learning - students engage in activities, such as reading, writing, discussion, or problem solving that promote analysis, synthesis, and evaluation of class content.

CASE 4	WALK AND TALK THROUGH APPLIED MATHEMATICS
TEACHER	PROFESSOR MSO HENRIK CLEMMENSEN PEDERSEN
COURSE	DEPARTMENT OF ENERGY TECHNOLOGY

THE CHALLENGE

Teaching control theory (applied mathematics) proficiently requires that teachers have a clear vision of the goals of instruction and how to address the specific mathematical content they are teaching. Not only do they need to know the mathematics they teach very well including how the theory relates to physical systems. They also need to be able to use their knowledge flexibly in their classroom practice to appraise and adapt instructional materials, to represent the content in an accessible way. This means they have to plan and conduct their instruction so they can also assess what students are learning.

Teachers need to be able to hear and see expressions of students' mathematical ideas and to come up with appropriate ways to respond. A teacher must be able to interpret their students' written work, analyze their reasoning, and respond to the different methods they might use in solving a problem.

Teaching applied mathematics requires the ability to adjust the teaching to the students' level of learning, understanding his/her current mathematical state and visualize the often abstract mathematical concepts to a level proper for the specific group of students. It is crucial to be familiar with mathematical ways of thinking and fundamental mathematical concepts to support that students' can develop their mathematical reasoning and skills along those trajectories. The teachers challenge is to deploy different, but strategic resources, to support the acquisition of mathematical proficiency.

IMPLEMENTATION

In this case we conducted a number of teaching observations that we video recorded and analysed.

Through our analysis we were able to identify Henrik's Pedagogical Content Knowledge.

Pedagogical content knowledge is a type of knowledge that is unique to teachers, and is based on the manner in which teachers relate their pedagogical knowledge (what they know about teaching) to their subject matter knowledge (what they know about what they teach).

We invited students who gave feedback and their insights on selected teaching episodes to explain how they experienced the teaching.

THE RESULTS

Based on the student feedback and our analysis we identified that the strength in the teaching approach was that three key components came together in Henrik's teaching:

Knowledge of mathematics

Knowledge of students

Knowledge of teaching practices

Knowledge of mathematics includes knowledge of mathematical facts, concepts, procedures, and the relationships among them; knowledge of the ways that mathematical ideas can be represented; and knowledge of mathematics as a discipline—in particular, how mathematical knowledge is produced, the nature of discourse in mathematics, and the norms and standards of evidence that guide argument and proof.

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.

Knowledge of teaching practice includes knowledge of 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 classroom discourse, and interactions and knowledge of classroom norms that support the development of mathematical proficiency.

COMMENTS ON THE APPROACH

Teaching (applied mathematics) entails more than knowledge about what makes a good instructional task, it also includes how to use a task effectively in class with a group of students.

To get a better idea of what this means in practice we recommend watching the short video clip below.

RESOURCES

Here is a link to a video showing selected episodes from Henrik Clemmensen Pedersen's teaching, based on what his students selected as reasons why they felt he is an excellent teacher.

https://edumedia.dk/media/t/0_1c9trygq

Here is a link to the Best evidence synthesis on teaching mathematics. Based on a literature review it provides short and concise material on mathematics pedagogy.

http://www.ibe.unesco.org/fileadmin/user_upload/Publications/Educational_Practices/EdPractices_19.pdf

Here is an example of a slide the students receive before class. What is annotated in red is what is discussed and worked through and what the students have to add to their copy to make sense of the taught comment. It is a half finished resource that requires that the students actively work through and complete with the teacher in class.

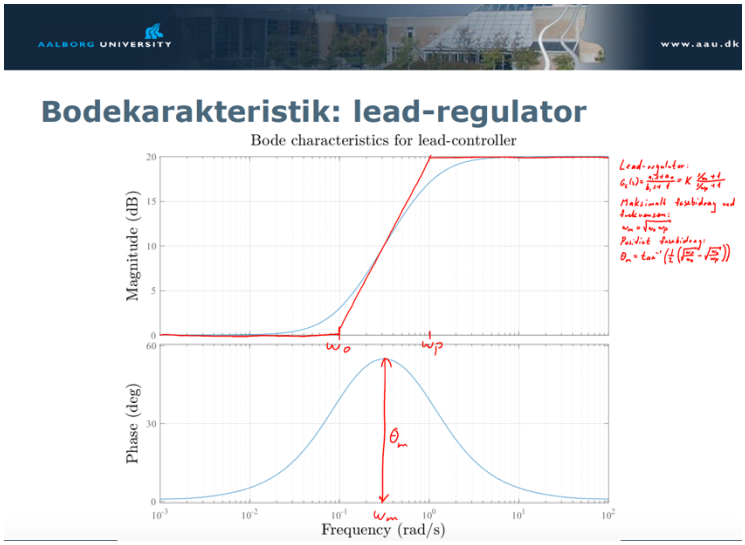


Figure 1: example of teaching material that is annotated in class

KEY CONCEPTS USED IN THIS SUMMARY:

Pedagogical content knowledge (PCK) - In addition to teachers' subject matter (content) knowledge and their general knowledge of instructional methods (pedagogical knowledge), pedagogical content knowledge was originally suggested as a third major component of teaching expertise, by Lee Shulman (1986; 1987). Pedagogical content knowledge is a form of knowledge that makes mathematical teachers teachers rather than mathematicians.

CASE 5	DERIVATION OF EQUATIONS OF FLUID MOTION: PENCASTS
TEACHER	ASSOCIATE PROFESSOR THOMAS RUBY BENTZEN
COURSE	HYDRODYNAMIC AND TIME SERIES ANALYSIS OF ENVIRONEMNTAL FLOWS 8TH SEMESTER WATER AND ENVIRONMENT / ENVIRONMENTAL ENGINEERING

THE CHALLENGE

This course requires that students acquire the competencies to process abstract information but overall there has been too little confrontation time available in class, to apply and practice thinking with new concepts.

In addition, the confrontation time in class could be used more "wisely", such as spending time on discussing more complex theories and physical understanding of the subject, have more discussion and opportunities to practice the application of new concepts.

An additional challenge is the nature of the subject: it is at times well defined and very "math-orientated" and does not require much talk - but modelling of how to calculate selected equations may still take between 10-15 min of class time.

IMPLEMENTATION

The idea was to produce Pencasts for selected topics to capture what would be usually done in class on video and post it on Moodle for students ahead of class time. Students would be able to access the material before class confrontation time. This would allow students to watch the pencast as often as needed. The Pencasts were recorded using Livescribe pen and Livescribe Notepad also called dot paper. There are numerous videos available and instructions – here is one for Windows and Mac users http://www.edlivescribe.com/?cat=15.

THE RESULTS

The Pencast was tested for one topic (derivation of the continuity equation). Based on the feedback from the students more Pencasts will be produced for the next time the course will be held.

The teacher and student reflections included:

Teacher

- Quality is not perfect – but acceptable
- This goes for both graphics and sound
- It gives the same benefits as using the blackboard, but frees up time in class
- (Almost) all students watched the Pencast before the lecture (students were asked to do so)

Students

- This work pretty well
- The Pencasts had a good tempo to follow
- It was easy to go back and forth
- The Pencasts can be used to introduce more complicated ideas

COMMENTS ON THE APPROACH

The implementation of this pilot was very encouraging and the idea is to produce more Pencasts – not only for this semester but also other courses, for instance 'Fundamental hydraulics', a bachelor course on the 3rd semester where a number of classes had to be cut back. One thing to remember is student workload – so it is important to keep in mind how much time the students will be required on preparing for classes, but it has the advantage that students can use the Pencats for exam preparation and revision purposes.

RESOURCES

Here is a link explaining how and why Pencasts could be implemented as part of the teaching approach https://edumedia.dk/media/t/0_4nvs2zoy

A Livescribe pen + paper (or alternative pencast hard and software) https://www.livescribe.com/en-us/smartpen/ls3/

If tablets with electronic pens are used it is advisable to test the audio quality and the format that the recording is produced as. Obscure formats can be converted using the open source platform Handbrake https://handbrake.fr/

You need a quiet room

Preferably an external microphone

Calculate time for preparation and trial 2 times before recording.

An interesting article written on the topic of producing and evaluating pencasts in undergraduate science courses:

Shaffer, A. K., & Schwebach, J. R. (2015). Usefulness of Livescribe Web Recordings as Supplemental Resources for a Large Lecture Undergraduate Course. Journal of College Science Teaching, 44(4), 54-60.

KEY CONCEPTS USED IN THIS SUMMARY

Pencast - a digital, interactive copy of your written notes combined with audio synced to those written notes

CASE 6	FLIPPED CLASSES AND WEB-BASED APPLICATIONS FOR BETTER UNDERSTANDING OF APPLIED STATISTICS
TEACHER	ASSOCIATE PROFESSOR SERGEY KUCHERYAVSKIY
COURSE	APPLIED STATISTICS IN THE DEPARTMENT OF CHEMISTRY AND BIOSCIENCE

THE CHALLENGE

The traditional format of giving two blocks of lectures followed by tasks students need to do in their groups does not sufficiently meet the students' needs when it comes to the learning of statistics within the fields of chemistry and bioscience. Offering tools for students to repeatedly deal with challenging content, to more efficiently getting feedback on the quality of their performance, and to try out different solutions several times in order to reach a better understanding, can be challenging when a traditional lecture format is applied.

IMPLEMENTATION

The innovative aspect of this project is to change the learning sequences for students to become more comfortable with engaging with challenging content and to become more active learners. The way to do this, is to include sequences of short videos and quizzes, interactive web-applications, group work on mini-projects, and to supply with a dedicated platform for online learning. This approach is a further development of the flipped classes idea, where the classroom-time includes sequences of e.g. exercises – discussions – quizzes. Furthermore, the implementation is inspired by the overall concept of MOOC – Massive Online Open Courses, which is a model dedicated for online learning where it is possible to include a large number of students (1000 to 10000), and where the interaction with teachers takes place only via forums. In addition to that, a set of interactive web-applications were developed and implemented to better understand some particular topics of the Applied Statistics course. The applications can be incorporated to any web-page (using iframes) and is currently used together with open edX platform for teaching Applied Statistics in the department of Chemistry and bioscience. The applications are written using Shiny — an R framework allowing to create interactive tools based on web-technologies. They can be hosted on any server via Shiny server. Both Shiny and Shiny server are free. The typical learning sequence for the course consists of short videos, quizzes including multiple choice questions, and the web applications. The edX platform makes it possible for the teachers to follow the course progress for each of the individual student, allowing for personalised help and guiding.

THE RESULTS

This approach of rearranging the sequences as well as designing them in the form of an open platform offers both teachers and students better insight into applied statistics; it becomes personalised offering the students improved opportunities for revisiting lectures through videos and, also, it incorporates the qualities of PBL into the online course design. Furthermore, it allows both students and teachers

to keep a quality control in almost real time. Support activities such as online forum discussions are examples of how this innovative approach can transform a traditional lecture into sequences of active learning.

COMMENTS ON THE APPROACH

This innovative approach includes that a number of web-apps including different kinds of problems to be solved have been developed. The experiences have shown that this approach have gained the students' overall understanding of applied statistics. However, further follow-up activities are needed.

RESOURCES

Examples of content of four web-applications that have been developed within this project targeting better understanding of applied statistics (Note: these can only be accessed when you are signed into your AAU University account):

Quantiles of random samples

http://edx.bio.aau.dk:3838/statapps/B101/

Use this app to investigate how well sample (blue points and objects) approximates a population (grey) depending on a sample size. Try both predefined and random samples, take a new random sample several times then change sample size and repeat this again. Try to play with several parameters/variables.

Uniform distribution

http://edx.bio.aau.dk:3838/statapps/B102/

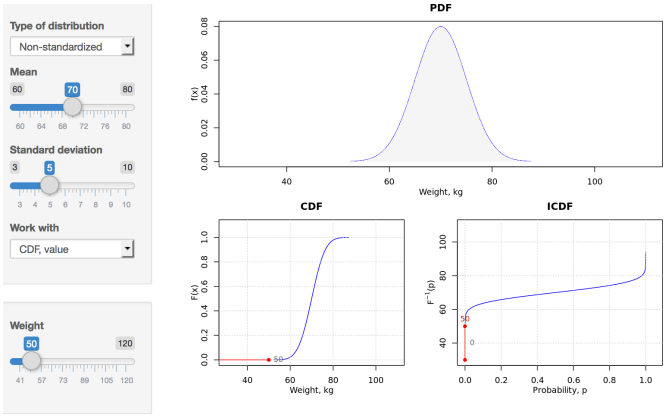
With this application, you can understand better how PDF, CDF and ICDF relate to each other and what they can be used for. The plots show these three functions for uniform distribution of people's weight (smallest number is 40 kg and largest is 120 kg). There are four options — you can work with CDF and select one value, in this case you will see the corresponding probability to find values below selected. You can also work with interval and select left and right values for the interval and see corresponding probabilities as well as how many values are inside the interval. If you chose ICDF you will be able to do the opposite — change probabilities and see the corresponding values.

Below two more advanced examples:

Normal distribution

http://edx.bio.aau.dk:3838/statapps/B103/

This Shiny app is similar to what you have used in the previous lecture, but shows PDF, CDF and ICDF for normal distribution. You can change mean and standard deviation or select standardized distribution (with mean = 0 and std = 1). Play with the app and try to solve several tasks, e.g. find out how many values are located between 65 and 75 kg, what is a range for 90% of most common/expected values etc. Then fix the interval and try to play with parameters.



Confidence interval for mean

http://edx.bio.aau.dk:3838/statapps/B201d/

In this app sampling distribution of mean (red curve on right plot) and 95% confidence interval (shaded area under the red curve) are computed using t-distribution and statistics of your current sample, assuming that the parameters of population are unknown. The blue vertical line on the small plot is true population mean, so you can see how often it will be inside the interval.

KEY CONCEPT USED IN THIS SUMMARY:

Active learning - students engage in activities, where they apply e.g. problem solving, discussion in online forums, repeatedly deal with challenging content, to act on almost real time feedback on the quality of the performance, and to try out different solutions and analyses over and over again targeting a better understanding of the content in question.

CASE 7	DIGITAL DAYS
TEACHER	ASSOCIATE PROFESSOR KJELD SVIDT
COURSE	DIGITAL DAYS, CROSS-DISCIPLINARY EVENT IN BIM

THE CHALLENGE

Digital Days has over the last 7 years been an annual engineering education PBL experiment in BIM (Building Information Modeling). Since the first run in 2010, a model for the Digital Days has gradually been developed, which in many ways challenge the normal framework of university programs. It is an approach that cuts across educational institutions in the region, across disciplines and with the involvement of external partners in the form of industry experts in the field of BIM.

In the article "Developing Student's Collaborative Skills in Interdisciplinary Learning Environments" Gnaur, Svidt and Thygesen (2015) analyzed the digital days in relation to the skills that the students and the external partners assessed as being the main contribution of the Digital Days workshop. The conclusion was, among other things, that the professional competencies in relation to cooperation with professional groups other than one's own was particularly valuable. This strengthened not only the professional self-awareness among students, but also the interdisciplinary collaboration capabilities that are part of working life in the construction industry.

However, the Digital Days project has not been grounded in a clear purpose since its first run and the development of a clearer and transparent pedagogical framework was needed. In this project, the aim has been to describe, discuss and develop the didactic elements of Digital Days with the goal of developing a clearer framework for the running of future Digital Days sessions.

IMPLEMENTATION

The framework for the projects work on the clarification of the didactics of Digital Days has been Hiim and Hippe's didactic relational model. It emphasizes the relationship between the 6 dimensions of the model:

1) Learning Requirements, 2) Frame factors, 3) Goals, 4) Content, 5) The learning process and 6) Evaluation and is often portrayed as the figure below where each point in the hexagon is a didactical dimension to be analyzed.

Here, we will only briefly describe some of the existing framework which functioned as a background for the analysis.

The content of the workshop is digital information management in construction and the workshop is presented to students at an introduction day about 14 days before the workshop. The workshop takes place over three intense days, where about 100 students participate. They are divided into four interdisciplinary teams and each must solve the same task in BIM. The assignment is every year to construct a digital solution - including a series of targets - to an existing planned construction. In the next Digital Days workshop, it is a building in the zoo to be developed for catering etc.

Each of the four teams consist of about 20 students. The students in the team come from different fields of study (specializations in building and construction, architectural students, construction engineers, building informatics, installers etc.). The team is composed of students from across institutions in the sense that students from UCN and AAU cooperate in on the team's tasks.

On the teacher side a group of supervisors helps the teams with specific tasks where students can draw "consulting hours" when the need arises. Digital Days is a completely voluntary activity in the sense that the process is not integrated into any curriculum and hence triggers no ECTS points and means for running the workshop. Digital Days requires some funding to settle practical details and the participating institutions provide rooms etc. The workshop has traditionally been placed in UCN's premises.

THE RESULTS

For an elaboration of the results of the didactical analysis in the 6 relational dimensions please contact ks@civil.aau.dk or orc@learning.aau.dk. To highlight some of the findings let us mention a few key issues:

The aim of Digital Days has been focused on the digital product in the form of a presentation of the building construction plans. This is a key goal but gradually the group of coordinators has seen a need for furthering a focus on the cooperation processes in each team. This has led to the suggestion of two additional dimensions in the goal and also evaluation dimensions of the workshop, namely regarding the technological platform cooperation in the teams as well as an ongoing organizational reflection in the team.

Another point relates to the status as a free study activity. Digital Days is a highly innovative PBL platform of value for the university in many respects and the identity formation of the students involved. However, the framework is vulnerable as a result of its non-constitution as a part of normal curricula or the official support from the AAU organization. This is a part of the framework that should be addressed.

COMMENTS ON THE APPROACH

The Digital Days workshop can be developed further into a general PBL platform for interdisciplinary workshops at AAU including participation of external partners. Digital Days represents a source of specific knowledge in running this type of activity that could be beneficial for other fields and topics

and there is great potential for reframing the concept in other areas and at a lesser scale to produce an alternative PBL environment for intensive periods during a semester.

RESOURCES

For a description of Digital Days see this video: https://youtu.be/DBWtblEaWz4

Hiim, H. & Hippe, E. (2007). Læring gennem oplevelse, forståelse og handling. København: Gyldendalske boghandel.

Gnaur, D., Svidt, K. & Thygesen, M. (2015). *Developing Student's Collaborative Skills in Interdisciplinary Learning Environments* in International Journal of Engineering Education, vol. 31, 1(B).

CASE 8	CASE BASED TEACHING – ETHICAL, THROROUGH AND FAIR DESCRIPTIONS OF TECHNOLOGY
TEACHER	STINE WILLUM ADRIAN
COURSE	TECHNOLOGY AND ETHICS, TECHNOANTROPOLOGY, 2. SEMESTER

THE CHALLENGE

Describing and analyzing complex technologies is a key competence for techno-anthropology students. This is often done through analysis of cases where specific technologies are described, analyzed and criticized from specific perspectives. In relation to the ethics course it has been perceived as a problem that the students are not strong enough in understanding the details of the technologies they use to discuss ethical issues. This means that there is tendencies to students build on intuitions and emotions rather than discussion concrete technological solutions. This lack of knowledge about the technological details hence compromises the theoretical orientation and analytical clarity of the students' work, since they fall back to a prejudiced affective modality.

IMPLEMENTATION

The focus of the innovation has been to teach the students how to describe a technological case in a fair and thorough way. Apart from being necessary in order to support the theoretical and analytic nature of the students work, this approach also teaches the academic skills of giving a fair account and the ethnographical ethics of reading a case in an emphatic manner.

The implementation has consisted of a further development of an existing practice where students present technologies and theoretical perspectives in class. The new aspects are:

1. That the students now deliver a written product describing the case they work with.
2. Ten questions guiding the case work in the same way as the students reading of theory have previously been scaffolded.

This approach was developed over some meetings between award teacher and supervisor, and the supervisor has observed some of the teaching using this approach.

THE RESULTS

The results are good in the sense that the presentations of technologies is now more detailed and elaborated than it was in the previous years. The approach will be continued.

COMMENTS ON THE APPROACH

We believe that the approach has generic value when working with cases in university teaching.

RESOURCES

Here is a link to a video where Associate Professor Stine Willum Adrian explains the background to this teaching innovation https://www.youtube.com/watch?v=j4GA0Q03GBU&feature=youtu.be

Here is description that can be used to share with students:

Når en teknologi eller et videnskabeligt projekt skal diskuteres med udgangspunkt i forskellige teoretiske forståelser af teknologi og etik, er det væsentligt, at have sat sig ind i teknologien. I case fremstillingen på dette kursus skal I lære at anvende jer af en "empatisk læsning" af teknologien for at få indblik i hvilke teknologiske, videnskabelig og normative forforståelser teknologien baserer sig på. Det vil sige, at vi forventer, at I har en så grundig forståelse af teknologien, at I har indsigt i hvad den kan og hvad den ikke kan, og samtidig kan beskrive dens normative projekt. Det kræver en grundig forståelse af de tekniske og videnskabelige detaljer. I forbindelse med de 3 hovedcases, skal I sammen i jeres grupper have skrevet mindst to sider om teknologien, som I kan anvende som udgangspunkt ved eksamen. Når I beskriver teknologien skal I tage udgangspunkt i følgende spørgsmål:

1. Beskriv hvad teknologien består af?
2. Hvem har udviklet teknologien?
3. Hvem skal bruge teknologien?
4. Hvorfor er teknologien blevet udviklet?
5. Hvilke (samfundsmæssige) problemer kan/skal teknologien løse?
6. Hvad skal teknologien anvendes til?
7. Hvad kan teknologien?
8. Hvad kan teknologien ikke?
9. Hvilke teknologiske/videnskabelige rationaler ligger bag udviklingen af teknologien?
10. Hvilke goder kan opnås ved anvendelsen af teknologien?