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The principles of teaching large classes.

Active teaching & learning are the underlying principles of teaching at SDU. [1] The university teacher is responsible for organising and conducting the teaching in such a way that it supports the students' active learning in and away from the teaching premises.

The principles of the teaching on the engineering programme and the implementation of these are described in more detail in the DSMI, the Engineering Education Model of the University of Southern Denmark, which emphasises that the teaching must be organised so that it supports activating teaching and active learning – one way of doing so is essentially to use four-hour teaching blocks from the 1st to 4th semesters, and as a more general rule to use hourly blocks, the number of which is determined by academic and pedagogic considerations (DSMI, p. 11).

Teaching in four-hour teaching blocks involves a wide range of exercises and theoretical reviews. The teaching in hourly blocks is organised so that it builds on the students' preparations and, generally speaking, supports the student's active learning as outlined below.
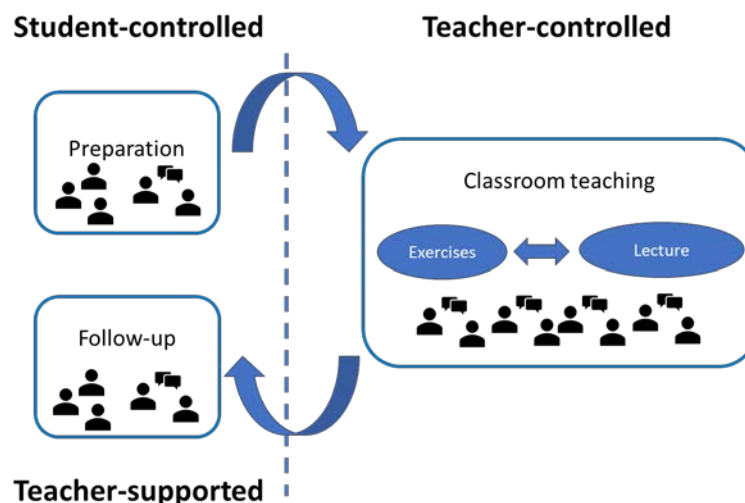
Large classes pose certain special challenges when it comes to organising and conducting the teaching so that it supports the students' active learning. This document describes the four principles of activating teaching, which help to overcome the special challenges of large classes. The four principles are as follows:

- **Activating teaching** - Activating elements are factored into classroom teaching.
- **Active students** - The teaching is organized in such a way that it encourages the students to prepare themselves before classroom teaching.
- **Feedback on learning –** Students receive feedback on their learning and have the opportunity to gain clarification on the subject matter.

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[1] A description of SDU's underlying principles of teaching can be found at the website for SDU Centre for Teaching and Learning. A description of the Faculty's principles can be found in the DSMI, the Engineering Education Model of the University of Southern Denmark.

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- **Collaboration, communication and relationships** - The teaching makes it possible for students to work together, communicate about the subject matter and form relationships with each other.

Every principle is described with an *intention*, the specific *challenge* posed by teaching large classes, proposed *solutions*, a toolbox with links to tools, techniques and methods and references to concrete *examples* of teaching practice from TEK.

Although the teaching examples are categorised, as far as is possible, into teaching models, the idea is that every university teacher at TEK should use the tools that give meaning to the specific course and create a teaching model reflecting the learning objectives of the course.

In the descriptions, a distinction is made between teaching and classroom teaching. 'Teaching' refers to the overall organisation and implementation of the teaching, which supports the students' active learning in and away from the teaching premises. Classroom teaching refers to the teaching that takes place at the teaching premises and which supports the students' active learning at the teaching premises themselves.

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Activating teaching

Intention	Activating elements are factored into classroom teaching to give the students an opportunity to reflect and apply their knowledge.

Challenge	Learning is about more than just listening – the student needs to interact with the subject matter too. They need to read, write, speak, discuss and solve problems. In large classes, it can be difficult to activate all students at the same time, e.g. getting all the students to express themselves at the same time. There is a particular need for tools, techniques and methods that facilitate the students' active processing of the subject matter.

Solutions	Presentation, Reflection, Expression, Questions, Problem-solving and Discussion are all instruments for ensuring activating classroom teaching.
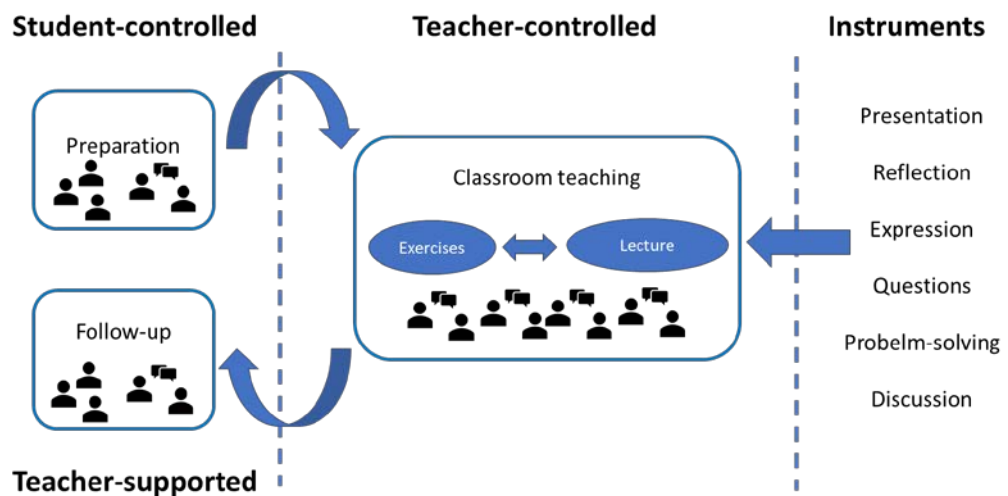
Concrete activating elements include written and oral reflection exercises, classroom polls and presentation of matters for discussion among students. Varying the instruments, e.g. by switching between exercises and review, will also encourage mental activation.

Toolbox	**Presentation** - Prezi: Dynamic presentations - Interactive whiteboards: Consecutive note-taking and customisation of these - Powerpoint: Option to incorporate Poll Everywhere **Expression, reflection, questions, problem-solving and discussion** - Think-pair-share: Individual reflection, discussion in pairs and sharing of pointers

- [One-minute-paper:](#) A set time for written reflection by the individual
- [Minitests:](#) Short tests on (for example) the previous week's subject matter
- [Handouts to support learning:](#) Handouts to activate and facilitate learning.
- [Student response systems:](#) Responses from all students at once, e.g. classroom polls.
- [Other: Concept maps, Peer discussion,](#) Cases, Padlet.

Teaching examples	**Team-based learning** Team-based learning is a teaching model, for which preparation, individual tests, group tests and problem-solving are all key words. The tests are 'Readiness assurance tests' which evaluate whether the student and the group have the necessary prior knowledge to resolve tasks.

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- [Camilla Fogh Larsen has used team-based learning in selected teaching sessions of the professional 'Road-building' course in the 4th semester and 'Building construction' course in the 1st semester.](#)
- [Torben Højland has trialled full use of team-based learning in an introductory mathematics course.](#)

Minitests for learning reflection

A minitest can be used as an element at the start of, during, or at the end of classroom teaching. These minitests are based on the subject matter taught the previous week. Minitests facilitate the students' preparations, provide ongoing feedback on the students' learning and repeat the course subject matter on an ongoing basis.

- [Henrik Midtiby uses minitests as an element of his teaching.](#)
- [Camilla Fogh Larsen uses minitests in the 'Building construction' course during the 1st semester.](#)

Student response systems (SRS)

SRS are voting and response tools that give the university teacher the option to ask questions during classroom teaching and receive responses from all their students. The responses are then presented visually, making it possible to gain a quick overview of the students' prior knowledge, understanding, attitudes etc. SDU has a licence for Poll Everywhere, which allows multiple choice as well as open-ended questions. Students can answer questions individually, in pairs, in groups or individually followed by responses in pairs/groups (peer instruction). Several publishers offer university teachers access to supplementary electronic course materials, including a compilation of questions suitable for SRS.

- [René Lynge Eriksen and Ole Albrektsen have experience of using Poll Everywhere to teach physics classes.](#)

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Active students

Intention	The teaching is organised so that the students make preparations before teaching in the classroom.
Challenge	For learning to be stimulating and effective, the students must be proactive in their work on the subject matter and the teaching must be organised so that there is clear interaction between the classroom teaching and the students' preparations. To ensure that the students feel that their input is paying off and needed, classroom teaching should be done on the basis that all students have prepared for it. In large teams, you may feel that not all students are spending enough time on preparation. The students may feel that it makes no difference what they do, while the university teacher may find it difficult to get an idea of the students' preparations. The university teacher has a particular need for tools, techniques and methods that will help the students to be proactive in their work outside of the classroom and which highlight the benefits of doing the preparations and consequences of not doing them.
Solutions	Subject matter, Reflection, Expression, Questions, Problem-solving and Discussion are all instruments, which can be used to get the students to actively process the subject matter in their preparations.

Concrete resources for furthering preparations for classroom teaching include induction videos, books containing interactive elements, online discussion and reflection, online peer feedback, self-evaluation tests, or activities in the teaching, in which the students are reliant on their own or each other's preparations and for which failure to prepare will have a noticeable impact. Concrete activities can be done individually or in groups, online or offline.

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Toolbox	**Subject matter**
	- Introduction videos
	- Instruction videos (method)
	- Interactive videos
	- E-books with interactive elements, e.g. Flash cards
	Expression, reflection, questions, problem-solving, discussion
	- Blog
	- Online written work with peer feedback
	- Readiness assurance tests (part of the team-based learning model)
	- Test, mini test
	- Online preparatory assignments
	- Case assignments
	- Discussion forum
Teaching examples	**Flipped classroom and blended learning** Flipped classroom is a teaching model that turns traditional teaching on its head. The student reviews theory (for example) by reading or watching videos as preparation for the classroom teaching. In the classroom teaching, this theory is used for problem-solving, with a focus placed on the elements of the theory that the students have found particularly challenging. Blended learning uses a combination of online learning activities and classroom teaching. - Rime Bahij El-Houri uses videos of method review prior to completion of practical assignments. - Henrik Midtiby uses videos of theory and method review, online completion of assignments and interactive videos, in which students complete assignments during the video. - Lone Borgersen uses blended learning in her 4-hour block teaching set-up. **Team-based learning** Team-based learning is a teaching model, for which preparation, individual tests, group tests and problem-solving are all key words. The tests are 'Readiness assurance tests' which evaluate whether the student and the group have the necessary prior knowledge to resolve tasks. - Camilla Fogh Larsen has used team-based learning in selected teaching sessions of the professional 'Road-building' course in the 4th semester and 'Building construction' course in the 1st semester. - Torben Højland has trialled full use of team-based learning in an introductory mathematics course. **Completion of assignment in the teaching followed by peer feedback** Lone Borgersen incorporates two hours of work on assignments, followed by two hours of theory, into her 4-hour block. The students need to come prepared for the assignment work so that they can complete the tasks satisfactorily within the two-hour timeframe. The theory relevant to the assignments will be reviewed after this point. To

finish the assignment, students will give each other peer feedback via Blackboard and improve their own submissions.

Minitests for learning reflection
A minitest can be used as an element at the start of, during, or at the end of lectures. These minitests are based on the subject matter taught the previous week. Minitests help with the students' preparations, provide ongoing feedback on the students' learning and repeat the course subject matter on an ongoing basis.
-   Henrik Midtiby uses minitests as an element of his lectures.

Just in Time Teaching (Jet)
Just in Time Teaching (JiTT) is a form of teaching whereby students answers questions prior to classroom teaching, with the university teacher then teaching a class on the basis of the students' responses. A number of subject-related question will be asked, as well as the general question "What did you find particularly challenging about today's text/assignment?" If no aspect was challenging, what did you find particularly interesting? To get the most out of the teaching process, the university teacher will only cover subject matter that the students found difficult and/or particularly interesting.

-   Lone Borgersen uses Just in Time Teaching, whereby students answer questions at the beginning of the teaching session.

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Feedback on learning

Intention	Students receive feedback on their learning and have the opportunity to gain clarification on the subject matter.
Challenge	If students are unsure what is expected of them, and how they will cope with the subject, there is a risk that they will not achieve their full potential. Each student must have the opportunity to gain constructive feedback on their level of subject matter knowledge and working process in a way that makes it possible for them to adjust their own input and strategy and in doing so increase the amount they learn. The individual student also needs to be able to deal with the subject-related questions that may need answers during the course. Feedback and clarification are often two sides of the same coin.
	Students can receive feedback as well as subject-related clarification on their work processes and their subject-related work from university teachers, student teachers, fellow students or the student themselves. Feedback from the university teacher is the traditional form of feedback given, with the student receiving feedback from an 'expert'.
	More often than not, the feedback process is a source of knowledge and insight that benefit both the university teacher and the students. All students should receive the feedback and subject-related clarification that is relevant to them.
	In large classes, there may not be sufficient time for a university teacher to give all students feedback of high quality, nor individual explanations of subject-related matter, and repeating the same feedback and explanations may be seen as a waste of time, which is why tools, techniques and methods are needed to make it possible to manage feedback and questions efficiently.
Solutions	**General feedback** Use general non-personalised feedback when the same feedback and subject-related explanation is relevant to many students at once, e.g. for typical errors and to highlight good or not so good examples. **Feedback from student teachers** Wherever possible, allow student teachers to provide some of the feedback. The university teacher's responsibility is to equip the student teacher for the assignment, which includes being explicit about what areas the feedback should given in. **Peer feedback** Allow the students to receive feedback on their assignments from one or more of their fellow students. Much can potentially be learnt from giving and receiving peer feedback, because the process invariably requires the student to reflect on their own tasks for work going forward.

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The university teacher has a responsibility to qualify the students to give each other feedback, so that they feel confident giving feedback and trust the constructive feedback that they receive. Peer feedback can be done either online or offline, or anonymous or not. Regardless of the format used, the university teacher should oversee the process and have a presence among the students, e.g. by highlighting examples of positive feedback or by themselves contributing feedback in the event that there are inconsistencies in the students' feedback.

Self-evaluation
Allow the individual student to gain an insight into their own progression and reflect on their working process and input through self-evaluation. This student self-evaluation can (for example) be done via a rubric or a test score on an online test.
The university teacher's responsibility is to prepare the tools that the student will need. During online tests, it is possible for the university teacher to provide automated feedback on the individual questions.

The university teacher also plays an important role, regardless of the form of feedback.

Toolbox	**All forms of feedback** Rubrics are a useful feedback tool, regardless of who is giving the feedback. Rubrics clarify, in table form, which subelements are expected in the assignment, and where on a scale a response needs to be to be (for example) unacceptable, acceptable or above expectations. As such, rubrics can be used to match student expectations, to provide guidelines during the students' assignment work and to homogenise different assessors' evaluations of the assignments. **General feedback** Show examples Interactive videos General feedback videos **Feedback from student teachers** Solutions offering guidance **Peer feedback** Peer feedback (e.g. in Blackboard or Peergrade) **Self-evaluation** E-tests with built-in feedback/response Portfolio (see example 21 in VUF)
Teaching examples[2]	**Videos** - Henrik Midtiby uses videos of theory and method review, online completion of assignments and interactive videos, in which students complete assignments during the video.

[2] Concrete examples rather than teaching models

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Presenting examples
- René Lynge Eriksen's student teacher shows 'best hits' from reports in the form of good and not so good examples The student teachers grade the reports; the 'best hits' presentation is a source of feedback both for the university teacher and the students.

- Lone Borgersen presents good examples of assignments and of peer feedback based on input from student teachers.

Feedback from student teachers
- Lone Borgersen supports student teachers with rubrics and by getting the student teachers to develop solutions for guidance.

Peer feedback
- Lone Borgersen uses peer feedback to improve the quality of the submissions.
- Camilla F. Larsen uses peer feedback in several semesters of the Civil Engineering programme.

Self-evaluation
- Henrik Midtiby uses minitests as an element of his lectures.

Written self-evaluation
Ib Christensen gets students to reflect on their own learning and input in a ten-page report on the course 'Experts in teams'.

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Collaboration, communication and relationships

Intention	The teaching makes it possible for students to work together, communicate about the subject matter and form relationships with each other.
Challenge	Collaboration, communication and relationships are key words in stimulating learning environments and have a major bearing on both learning the subject and motivation to study.
	- Collaboration trains important skills for study and work and expands what each student can potentially learn.
	- By communicating the subject matter, either verbally or in writing, the student will gain a clearer idea of their own understanding and work proactively on the language of the subject matter and on communicating the knowledge of the subject matter.
	- Study-related relationships help to strengthen student affiliation and, therefore, motivation for the study. A student who has good relationships with fellow students (and faculty employees) will feel more inclined to put effort into their study and less inclined to drop out.
	The three key words often go hand in hand: collaboration requires communication, and communication and collaboration together build relationships.
	In large classes, particularly during plenum activities, it can, however, be difficult for the individual student to express themselves and communicate the subject matter; there is also a danger that the student will feel invisible and alienated from the crowd. Learning activities that give the individual the chance to communicate and build relationships with other students will be needed.
Solutions	Learning activities that encourage collaboration, communication and/or relationships can be incorporated into all phases of the teaching, whether preparation, classroom teaching or final tasks on an assignment.
Toolbox	Think-pair-share Discussion boards Peer discussions Peer instruction Group submissions Blended learning

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| **Teaching examples**[3] | **Online discussion in discussion forum**
With online discussion, students have the opportunity to express themselves with regard to the subject matter and gain a deeper understanding of the subject matter through dialogue with others.
   - Lone Borgersen uses online discussion to improve collaboration on the preparation.

Online written work in wiki
Online written work with peer feedback gives students the chance to train their ability to express themselves in writing and, through peer feedback, achieve a deeper understanding of the subject matter.
   - Lone Borgersen uses online written work to boost active learning, communication and collaboration.

Blended learning
Blended learning uses a combination of online learning activities and classroom teaching.
   - Lone Borgersen uses online peer feedback and online discussion to increase communication, collaboration and the quality of the submissions.

Team-based learning
Team-based learning is a teaching model, for which preparation, individual tests, team tests and problem-solving are all key words. The tests are 'Readiness assurance tests' which evaluate whether the student and the team have the necessary prior knowledge to resolve tasks.
   - Camilla Fogh Larsen has used team-based learning in selected teaching sessions of the professional 'Road-building' course in the 4th semester and 'Building construction' course in the 1st semester.
   - Torben Højland has trialled full use of team-based learning in an introductory mathematics course. |

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[3] Concrete examples as well as teaching models