# Annual progress report 2018 for Chi: Collective. Individual.

# Organization

The project has been led by project manager Magnus Lilledahl. Magnus Strøm Kahrs has worked full-time as a coordinator for the project (currently on paternity leave until March 2019).

Main collaborators have been professor Øyvind Sandbakk at NTNU center for elite sports research and professor Hermunddur Sigmundsson, department of psychology, NTNU.

8 students have worked on the project

# Economy

The budget for 2019 was 1299 kNOK. The departmental project account balance for 2019 shows a spending of 466 kNOK. The major cause of this discrepancy are 1) that the hiring of the coordinator was delayed by 3 months, 2) we have not been able to hire phd-candidates to do their duty work on the project due to large demand by the department to perform ordinary teaching but had to rely on students that have a significant lower cost, 3) difficulty in hiring computer science students and therefore lack of progress in work package 3 (we are proposing a change in this work package). Besides work package 3 the project is on schedule even considering the late hiring of personnel.

# Work packages

## WP1 framework

The main goal of Chi is to promote a culture for quality for learning among students and staff, both at the collective and at the individual level.

In this work package we are establishing a framework that will support such a development. The framework should promote collaboration, reuse, pedagogical training, and clear progressive connections between learning outcomes.

One of the key hypotheses of this framework is that one of the barriers for faculty to adopt improved methods of teaching, is the lack of training and the worry that implementing the changes will take too much time. A part of this framework is therefore to develop short, targeted, hierarchical training programs that will train faculty in specific didactical techniques or pedagogical theories.

The training program includes a close follow up by project staff which we think is necessary as old habits take time to change.

The first module that we have created is based on so called Student response systems (SRS) since the use of such methodology seems to be increasing. There is a lot of theory and research behind optimal use of student response systems but there seems to be a lot of suboptimal use, especially with the popular Kahoot system where the usage is often counterproductive from a pedagogical viewpoint.

The module consists of several written components that are used to develop the teacher’s competence

* A one-page summary of how to use SRS in a pedagogical effective way
* A one-page summary of how to technically run an SRS session (we are using the system from Mentimeter)
* A longer text that provides more details on pedagogy and references to research results where the teacher can find more resources if he desires.

In addition to the written modules, we have developed practical training sessions. The teacher is encouraged to read the one-page summaries before the sessions.

* A 45 min session where the teacher can try out the practical aspects of using the specific SRS system (mentimeter)
* A 45 min session where the teacher can learn to create good questions by evaluating existing questions and also how it feels like to be student.

Creating good SRS questions are not simple. We have therefore created a common repository for SRS questions, available to the whole department, so faculty can reuse and share their questions (the repository uses the cloud based LaTeX platform Overleaf (formerly Sharelatex) that supports collaborative projects).

Another major goal of this project is to encourage a more collective approach to teaching. A more collective approach will facilitate better connection between courses. We are in the process of establishing a simple way of documenting detailed learning objectives and the connections between these learning objectives. From this data we can create a graph of connected learning outcomes. We are in parallel developing a web-based solution to visualize connections between learning outcomes and how courses are connected. We have developed early prototypes for this.

A side result for this project has been to suggest a new taxonomy of learning outcomes that is more objective and quantitative. Instead of relying on Blooms taxonomy, learning outcomes are classified according to their complexity and their depth. The complexity is given by the number of learning outcomes that lead up to the learning objective, while the depth is given by the longest chain of learning outcomes that precede the learning objective.

### Test cases

As was planned in the project proposal, the framework is tested on two courses in electromagnetism at the department of physics (FY1003 and TFY4240). The teachers of these courses have completed the training described above and the students in the project have developed questions in collaboration with the teachers. As of January 2019, the teachers of these courses are using SRS systems basically every teaching session and by giving continuous feedback on their use we see great improvement in the use of the teaching methodology.

We have also been able to recruit an additional course (FY0001) that was also interested in methodology and where the teacher has received training in SRS. This has encouraged us to also try to recruit more courses to the framework throughout the project period.

### Research

Several tests are being used to assess the results of the interventions that are in place.

* Class room observation protocol (COPUS). This is a tool that is used to evaluate the learning activities that are used in class. It records what the teacher is doing and what the students are doing. This is a good tool to evaluate whether there is an increase in active learning in the classroom.
* Patterns of adaptive learning scales (PALS) A tool to measure goal orientation (see WP2).
* Concept Inventories. These are conceptual tests that have been validated to test conceptual understanding. They are employed as pre- and post-test to calibrate for incoming student knowledge. We are using BEMA and CUE-CMR for FY1003 and TFY4240 respectively.
* Grades will also be collected and compared with the concept inventories
* Interviews with students and teachers involved in the project will be conducted at the end of the spring semester.

Approval from NSD has been given to collect the personal information indicated.

## WP2 Elite sports

Training for elite sports is characterized by a research based and methodological use of exercises that has been shown to promote the best performance. This is not the case in higher education where the widespread mode of teaching is far from the methods that have been proven in research.

The goal of this project is thus to collect inspiration for how things are done in elite sports and translate these into a format that is applicable to academia.

We have recruited two students that have participate in elite sports at the national level (sailing and ice-hockey) and have collaborated with professor Øyvind Sandbak who heads NTNU center for elite sports research.

In the first step of this work package we identified important features of a training program in elite sports and that could be transferable to academia. Some of the elements identified

* Goal orientation (mastery or performance) and motivation
* Setting goals
* Making plans and evaluating plans
* Variation in focus throughout training period.
* Maintaining motivation
* Quality of training (focus)
* Rest
* Team spirit and support
* Grit

To facilitate the translation from sports into cognitive learning we collaborated with professor Hermunddur Sigmundsson from the department of Psychology to identify results from cognitive psychology for the most important aspects that affect learning. The central points were

* Learning requires focus
* Learning is specific (no far transfer)
* Appropriate level of challenge

Based on this inspiration we have develop new learning activities for the problem sessions in TFY4240. This is being tested in the spring semester 2019.

## WP3 Contest webs

The main idea behind WP3 was to utilize and stimulate student engagement in education. The idea was to use a software platform (xcolab) based on the contest web concept.

This project met several difficulties.

The first obstacle was the implementation of the software platform. It was difficult to recruit enough computer science students and with the students we hired the implementation of the platform proceeded more slowly than anticipated. A version of the platform was installed at <https://xcolab.it.ntnu.no/> but the page is currently down for unknown reasons

Second, the idea of using the contest web did not gain much traction in the project group, the concept seeming too complex for this level.

Therefore, the work towards the xcolab platform has been terminated and we will pursue a simpler approach with the same goal.

The main goal of the work package was to elicit input and creativity from the students. Through the ISSOTL conference in Bergen in 2018 we met the concept of student-teacher partnership/students as partners. The goal of this concept is the same as ours – to create student engagement.

At the conference a model for students as partners was presented. Small funds are made available for students that have an idea for project that in some way will develop new learning activities for students. A non-exclusive list of examples is new lab-experiments, demonstrations, learning materials, simulations, particle accelerators and gravitational wave detectors.

If successful such a model can be implemented as a normal component of the departments effort the build a closer connection between the students and the faculty.