



**Title:** A card game for helping faculty members designing blended learning activities

**Keywords:** Digitalization of education, Teaching and learning in higher education

**Presentation format:** Presentation

**Authors:**

Anna Mavroudi<sup>1</sup>, Teresa Almeida<sup>1</sup>, Susanne Frennert<sup>2</sup>, Jarmo Laaksolahti<sup>1</sup> and Daniel Harding<sup>3</sup>

<sup>1</sup>KTH, Media Technology And Interaction Design

<sup>2</sup>KTH, Biomedical Engineering And Health Systems

<sup>3</sup>KTH, Chemical Engineering

**Abstract**

## **A card game for helping faculty members designing blended learning activities**

### **Background and purpose**

The benefits of game-based learning (GBL) are well documented in the literature (see for example: Marlow, Salas, Landon & Presnell, 2016). This study involves GBL as an active learning method that could be used as an entry point to help faculty members design a blended learning experience for their students. Also, the purpose was to make it easier for the tutors to rethink their own teaching activities and incorporate elements of blended learning in them.

### **Work done**

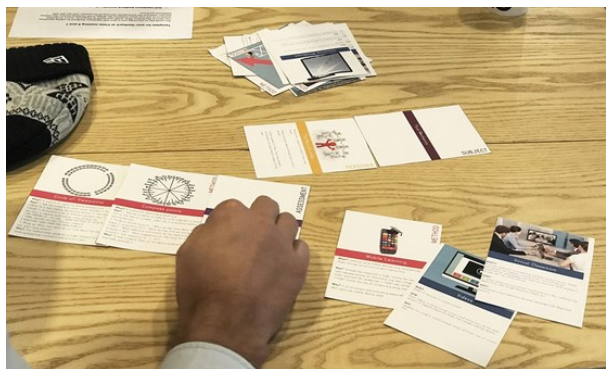
We have created a simple card game that allows tutors to explore various ways of blending their teaching in a playful manner. In this game, the tutors use cards (made out of paper) and some game mechanics and they adopt a mix-n-match approach across several card categories. Each card has a simple description of some blended learning component. The card categories are:

- Personas like the nerd, the teacher's pet, the unmotivated teacher, the "know-it-all" teacher
- Tools like blogs, learning management systems, virtual classroom systems
- Ways of teaching and learning, like project-based learning, socratic method, flipped classroom
- Missions like make students thinking visible, win the cognitive conflict!
- Student assessments (diagnostic, formative, summative)
- Criteria, like contrastive alignment



**Figure 1.** Examples of cards

We pilot tested the game with ten faculty members participating in a university pedagogy course at KTH. Three of the authors were taking observations during the gameplay. At the end of the game, the tutors completed an evaluation questionnaire. The game itself had two rounds with hands-on activities comprised of creating 1) a worst-case scenario and 2) the best scenario of a blended learning seminar.



**Figure 2.** Game play during the pilot, making scenarios.

## Observations

At first, “in the worst-case scenario”, the tutors were more occupied in understanding the game mechanics than actually designing a blended learning seminar, but during the second round the focus shifted from the game mechanics to the actual game challenge. The participants had lively discussions and collaborated even though they were supposed to play against each other in the groups. All tutors actively participated, although some were more dominant than others.

The following-up questionnaire revealed that the participants perceived the game as engaging and that it gave a good overview of the challenges of teaching and possible solutions as well as provided room for reflections. On a more critical note, the questionnaire revealed that the participants would have liked clearer guidelines and instructions since the game was perceived as complicated at the beginning but became easier to play after the participants understood its mechanics. Some participants commented

that they would have preferred if the personas represented different learning types and that we had ended the seminar with a more thorough wrap up and summary.

### **Take-home message**

The participants were immersed and engaged in playing the game. All tutors actively participated, although some were more dominant than others. It seemed as if the game created a culture of joy as the atmosphere was positive and filled with laughter. Yet, the observations revealed that it may be beneficial to have a game moderator at each table or in each group to facilitate the game, at least in the beginning. Also, it emerged that in its current form the game cannot be used to make the tutors design better blended learning activities, but rather as an entry point to designing for blended learning. Finally, the tutor of the university pedagogy course who was observing the game said that from her point of view it was interesting to hear the design decisions of the players/tutors with respect to blended learning. Indeed, facilitating decision-making is one of the benefits of GBL (Kapp, 2012).

### **References**

- Kapp, K. M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons.
- Marlow, S. L., Salas, E., Landon, L. B., & Presnell, B. (2016). Eliciting teamwork with game attributes: A systematic review and research agenda. *Computers in Human Behavior*, 55, 413-423.



**Title:** A student questionnaire that supports quality and programme development

**Keywords:** Course development, Student engagement and motivation

**Presentation format:** Presentation

**Stage of the project:** Finished

**Authors:**

Felicia Leander Zaar<sup>1</sup> and Magnus Andersson<sup>2</sup>

<sup>1</sup>KTH

<sup>2</sup>KTH, Applied Physics

**Abstract**

### **A student questionnaire that supports quality and programme development**

Felicia Leander Zaar<sup>a</sup> and Magnus Andersson<sup>b</sup>

<sup>a</sup>Master responsible student, Master's programme in Engineering Physics, THS Tekniska Högskolans Studentkår, 100 44 Stockholm, Sweden

<sup>b</sup>Programme director, Master's programme in Engineering Physics, Materials- and Nanophysics, Dept. Applied Physics, KTH, Electrum 229, SE-164 40 Kista, Sweden

### **Background**

Quality of higher education is often discussed within the framework of standards and guidelines for quality assessment in higher education (ESG), which e.g. states that there should be appropriate procedures for dealing with students' complaints [1]. This statement ignores, however, that student views can be useful for creating innovative ideas within a programme and says nothing about how to create a trustful student-faculty relation. In this work, we describe an approach to support all these aspects.

### **Work done**

The basic idea was to develop a questionnaire where students should feel safe and motivated to give any type of feedback to the programme in an organized way. At the same time, the programme should develop an efficient way for considering this feedback. This should help to develop a fruitful student-faculty dialogue about programme development and pedagogics.

The questionnaire was developed by the master responsible student, through an iterative process, where student feedback was used to successively improve the questionnaire. Student views on the

questionnaire were also gathered during group discussions at a student meeting. Based on this feedback, a final version of the questionnaire was developed and a strategy to handle the outcome was developed by the programme director.

### **Our solution and some results**

The result of this work was a questionnaire with only two questions [2]. The questionnaire is administrated through KTH Forms and a link to the questionnaire is sent to students two weeks after the start of each period. One week later, master responsible student and programme director meet to discuss the results and decide upon how to proceed with issues raised in the questionnaire.

The timing of the questionnaire was chosen to allow for potential emergency actions in courses before the exam period and to avoid interfering in time with the mandatory course evaluations. The small number of questions was based on an efficiency demand from students, who wanted it to be short.

The issues raised in the questionnaire are handled based on whose responsibility it is to reflect and act upon them:

- *Course level issues* are forwarded to the course responsible teacher, who is expected to act on urgent issues. A follow-up is done in the course analysis.
- *Programme level issues* are handled by the programme director.
- *Administrative level issues* are forwarded to the administration.

Furthermore, the programme director gives feedback to students on the programme website about how their issues are handled (course level issues are only displayed if they are of general interest). [3] For strategic issues, the programme director initiate continued discussions at student meetings, at teacher meetings or/and at the programme board meeting. Other issues are solved through collegial discussion or an explanatory answer is given on the website. The necessity of feedback to students about what happens with their comments was an outcome from discussions at the student meeting.

This model has been used in practice since period 4 in Spring 2018. In our presentation, we will share experiences and outcomes achieved so far. Some examples of outcomes are:

- Prevent a schedule collision between two courses.
- Create new web pages for double degree students so that they have easy access to programme information.
- Improve the web information about the master's degree course.
- Solve an administrative problem with exam registration.

### **Take-home message**

Design a good and efficient way to involve students when making educational change and improving programme quality!

[1] Standards and guidelines for quality assurance in the European higher education area (ESG). (2015), ENQA, Brussels, Belgium.

[2] The two questions were: i) So far, what has worked well during this period? and ii) What improvements would you suggest?

[3] The feedback page can be accessed by anyone with a KTH account at URL:  
<https://www.kth.se/social/program/ttfym/page/student-input-to-programme-quality/>



**Title:** An investigation of what students that did not fill in the course questionnaire think of the course

**Keywords:** Assessment, Course development

**Presentation format:** Presentation

**Stage of the project:** Mid stage

**Authors:**

Hans Havtun<sup>1</sup> and Niclas Hjelm<sup>2</sup>

<sup>1</sup>KTH - ITM School, Energy Technology

<sup>2</sup>KTH - CBH School, Biomedical Engineering And Health Systems

**Abstract**

### **Background and Purpose**

Students' views of a course is one of the major inputs for assessing the quality of a course and a source of ideas for course development. One of many ways of giving the students a chance to voice their opinions of a course is through a course evaluation questionnaire. As more and more courses are collecting student feedback this way, students may have four or more questionnaires to fill in at a certain point in time. This often leads to a low response frequency. Some teachers even say they disregard the results of the course questionnaire based on the fact that the response frequency is too low, and therefore not representative of the student group.

### **Work in Progress**

What does the evaluation data say if the response frequency is low? How representative is the data of the views of the entire student group? Can the data be used at all? These are questions we aim to investigate.

This type of study has been done at Lund University, Borell and Gudmundsson (2009). We replicate the investigation with a slightly different approach. In order to investigate what students that have not filled in the web-based questionnaire think of courses, we arrange an occasion where the student group are given an opportunity to give their feedback again in an identical paper-based questionnaire. This is done during a lecture in a subsequent course in the students' program. The method builds on the idea that the paper-based questionnaire will have a higher response frequency as compared to the web-based one. The outcomes of the two questionnaires can then be compared to see if the web-based questionnaire is representative of the entire student group.

### **Results and Observations**

Initially, we aimed at gathering data for 5-6 courses in time for the KTH SoTL conference. Unfortunately,

we were only able to obtain data for two courses, one of which yielded too low response frequency in the web based questionnaire to be useful for comparison in this study.

For the remaining course, the response frequencies were 28 % (N = 26) and 51 % (N = 47) for the web based, and the paper based questionnaires respectively. In total, 93 students were registered to the course. The questionnaire used was LEQ22 in which the students respond to 22 statements on a 7-step Likert scale from -3 (disagree) to +3 (agree).

The mean values for each statement were calculated, as well as the difference between the mean values of the paper based and web based questionnaires. It was found that the differences generally were quite small. The mean value of the differences over the 22 statements were -0.22 with a standard deviation of 0.42. This is comparable to the data in Borell and Gudmundsson (2009). Out of the 22 statements, no difference were greater than  $\pm 1.0$  on the LEQ scale, and 17 out of the 22 statements had differences less than  $\pm 0.50$  indicating that the results of the web based questionnaire is representative of a larger student group.

Comparing the results of the students answering both the web based and the paper based questionnaires, we see even smaller differences. On average, the difference was 0.02 with a standard deviation of 0.34. This indicates that the views of the course had not changed much, even though some time had elapsed between the web based and the paper based questionnaire.

During this process we have identified a number of courses that we will gather similar data from during the next coming weeks for a later publication.

### **Take-home Message**

Based on the data presented in this investigation we would like to suggest that even though the response rate of a web based questionnaire may be as low as 25-30%, the results can still be seen as representative for a larger student group.

### **References**

Borell, J., Gudmundsson, A., 2009, Vad tycker de som inte svarat på kursvärderings-enkäten?, Proceedings Utvecklingskonferens Lunds universitet 2009, pp. 79–85, <http://lup.lub.lu.se/record/1690272>





**Title:** Blended Learning in Engineering Education in Mechatronics

**Keywords:** Course development, Digitalization of education, Pedagogical teaching tools, Student learning, Teaching and learning in higher education

**Presentation format:** Presentation

**Stage of the project:** Mid stage

**Authors:**

Nihad Subasic<sup>1</sup> and Hans Johansson<sup>1</sup>

<sup>1</sup>KTH, Department Of Machine Design Mechatronics

#### **Abstract**

##### Abstract

The purpose of this paper is to describe how the Learning Management System (LMS) Canvas has been used as a platform for engineering education in the courses MF1016 Basic Electrical Engineering and MF133X Degree Project in Mechatronics at Royal Institute of Technology (KTH). This paper is partly a theoretical approach and partly a case study of the application of the LMS Canvas in the mentioned courses in the First Cycle or a Bachelor's degree.

It has been over a decade since the last research on this particular field, and the circumstances and conditions for education in mechatronics at KTH have changed, not least when it comes to the technological development. The development of the digital electronics on the one hand and the development of the communication technology on the other hand give us the necessary platform to develop the investigated course as a blended course. The main inspiration comes from MOOC (Massive Open Online Courses) and partly from the new components that give us the opportunity to develop new laboratory exercises. Further, the development of the surrounding technologies creates the opportunity to develop even the course's didactics, moving the focus from teaching to learning. Furthermore, it offers opportunities for personal development for the teachers by switching their own role, going from a preacher at scheduled hours to a collaborative coach available more or less 24/7 for students.

The investigated course has been developed using the ADDIE (Analyse – Design – Develop - Implement) concept described in the paper. The students involved in the Degree Project are encouraged to work in pairs with their own cyber-space named by project number and name.

The knowledge in the investigated course came by interaction both in the laboratory and online in the LMS. After a thorough analysis of the investigated courses several important changes have been proposed which could ultimately impact the development of our way of educating future engineers in

mechatronics.

Several digital tools have been used in development of the different goals of the courses. Courseware Möbius has been used even in assessments and achieved experience will be shown here.

Key words

Engineering education, Degree project, blended course, mechatronics, LMS, ADDIE, Möbius



**Title:** Blended Learning in Engineering Education in Mechatronics

**Keywords:** Assessment, Course development, Digitalization of education, Peer learning

**Presentation format:** Presentation

**Stage of the project:** Mid stage

**Authors:**

Hans Bengt Johansson<sup>1</sup> and Nihad Subasic<sup>1</sup>

<sup>1</sup>KTH, ITM, MDA

#### **Abstract**

The purpose of this paper is to describe how the Learning Management System (LMS) Canvas has been used as a platform for engineering education in the courses MF1016 Basic Electrical Engineering and MF133X Degree Project in Mechatronics at Royal Institute of Technology (KTH). This paper is partly a theoretical approach and partly a case study of the development of the mentioned courses in the First Cycle or a Bachelor's degree by using application of the LMS Canvas.

It has been over a decade since the last research on this particular field, and the circumstances and conditions for education in mechatronics at KTH have changed, not least when it comes to the technological development. The development of the digital electronics on the one hand and the development of the communication technology on the other hand give us the necessary platform to develop the investigated course as a blended course. The main inspiration comes from MOOC (Massive Open Online Courses) although the mentioned courses are not distance courses. Further, the development of the surrounding technologies creates the opportunity to develop even the course's pedagogical approach, moving the focus from teaching to learning.

Furthermore, it offers opportunities for personal development for the teachers by switching their own role, going from a preacher at scheduled hours to a collaborative coach available more or less 24/7 for students.

The investigated courses has been developed using the ADDIE (Analyse – Design – Develop - Implement) concept that we got inspiration in the course LH218V. The students involved in the Degree Project are encouraged to work in pairs and LMS Canvas is customized giving opportunity to have own cyber-space named by project number and name. Peer reviewing has been used in the Degree Project and students shared comments on each other report by using Speed Grader.

The experience and the knowledge that we, both teachers and students, got during developing of the

investigated courses came by interaction both in the classroom and online in the LMS. After a thorough analysis of the investigated courses several important changes have been proposed which could ultimately impact the development of our way of educating future engineers in mechatronics.

#### Key words

Course development, Digitalization of education, Degree project, Peer learning, blended course, mechatronics, LMS, ADDIE, Möbius



**Title:** Building program communities on many levels: group-, department-, school-, university-, national and international mechanical engineering program communities

**Keywords:** internationalization, Peer learning, Teaching and learning in higher education

**Presentation format:** Workshop

**Authors:**

Martin Edin Grimheden<sup>1</sup> and Anders Söderberg<sup>1</sup>

<sup>1</sup>ITM, Machine Design

**Abstract**

### **Background and purpose**

The Mechanical Engineering program at KTH traces back to 1827, integrated with the history of KTH. Since 1827, many programs have come and gone. Many of the current engineering programs relate to the mechanical engineering program as spin-offs or former specializations. Programs such as Industrial Engineering and Management, Media, Vehicle Engineering existed as tracks or specializations within the mechanical engineering program before being launched as individual programs.

### **Work done/work in progress**

In 2018, KTH took the initiative to re-establish a national community for mechanical engineering programs. All program management groups of all Swedish programs on BSc and MSc level were invited to a two-day workshop focusing on the long-term development of education in mechanical engineering in Sweden. Basically all programs in Sweden were represented, six programs on MSc level and about 15 on BSc level.

The KTH mechanical engineering program management group is active on an international level as well, with an engagement in the American Society for Engineering Educators where the Mechanical Engineering Division gathers representatives from most US engineering and many international schools.

### **Results/observations/lessons learned and Take-home message**

The above groups and communities are crucial for discussions on long-term program development. For academic staff, the search for knowledge and insight in program development issues is fostered by an

open and honest discussion among peers, based on scientific results and proven experience. The proposed workshop intends to gather peers to further discuss methods, tools and structures to foster the discussion – best practices, recommendations and suggestions on how to enhance the collegial discussions from research-group level to the international arena.



**Title:** Can using Sankey diagrams to visualize when and where students fail courses during their education be a relevant tool for teachers?

**Keywords:** Course development

**Presentation format:** Presentation

**Stage of the project:** Early

**Authors:**

Mikael Eriksson<sup>1</sup>

<sup>1</sup>EECS, UK

## **Abstract**

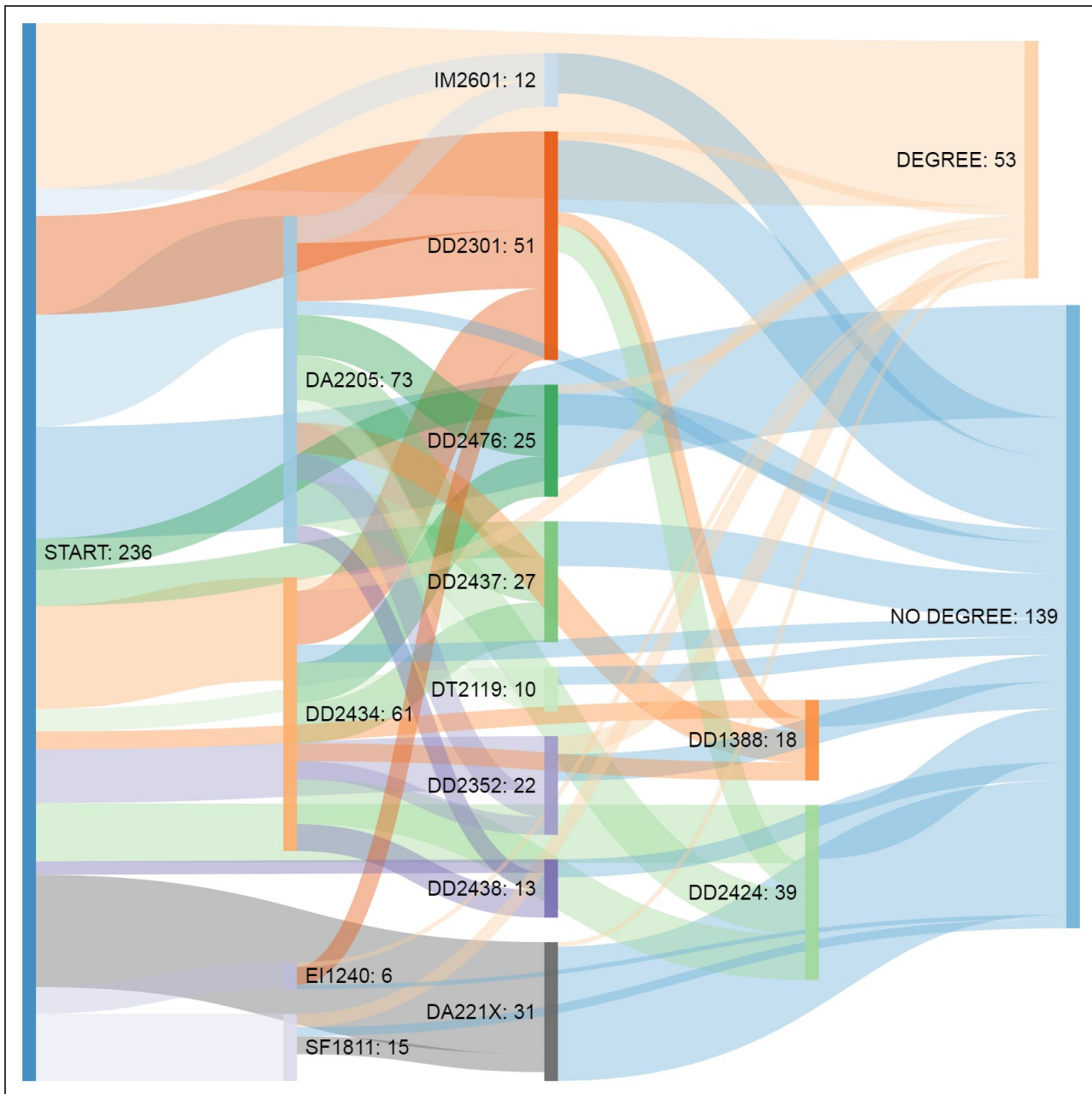
### 1. Background and purpose

Sankey diagrams are a popular way of visualizing flows. Many have used Sankey diagrams to visualize student pathways through education and career choices. I have experimented with such diagrams in trying to find a way that would illustrate in a clear way where students fail or get delayed during the course of their education and how those failures relate through the education.

Having knowledge about possibly critical courses in an education program can be important when considering course development from a strategic viewpoint, in an effort to improve education attainment and throughput, but it may also be fruitful to consider this kind of information in a more local collegial context.

### 2. Work done

Based on historical data I have experimented with building Sankey diagrams that shows on which courses students tend to fail and for each such specific course, in what proportions the failures occur together with other failed courses on earlier semesters in the education.



The type of failure considered here is the event that a student enrolls on a course but either never completes it or has a considerable delay compared to the nominal time before passing.

I built the Sankey diagrams by implementing a graph algorithm and using a web site that can draw the diagrams based on the generated graph representation. The algorithm is far from mathematically exact and there are surprisingly many technical details that would need to be sorted out to make it rigorous. For example there are the issues of having to select and cut away edges, preferably the least significant ones, to make the resulting diagram visually tractable and the issue of finding and removing potential cycles in the graph to make it valid for Sankey representation.

It follows that there are multiple challenges in trying to make a diagram that is faithful to the data, but it can certainly be used to identify edges and paths that may be of interest to analyse further by other means.



### 3.Results / observations

One PA was struck by how clearly the diagram pointed out a course that they by other means already knew had problems. Even though the Sankey diagrams don't tell anything about the causes behind the data, it may reveal interesting patterns for someone with good insight into the education program, that could be used for guiding further investigations.

Talking with teachers gives that they have practical reasons for primarily being concerned with synchronous issues like scheduling of courses that are given in parallel. They are also interested to learn about methods used on courses that are similar in subject, whether or not they are part of the same education program.

It is interesting to consider what insights could be gained if two teachers with courses related by the Sankey diagram get together, but given the wide range of possible causes behind the data they may also feel that it is a hard task for teachers to speculate about them.

### 4.Work to be done

Considerable work would be required to make the Sankey diagrams a rigorous representation of the data but with a reasonable confidence they already show pathways that would be of interest for further investigation.

And what could be the possible causes of the observed course performance patterns? Are there some common factors involved? How do students prioritize if and when they are having problems passing courses? There are many interesting questions that could be asked. If some reasonably clear causes could be identified the hope is that they can be mitigated for instance by making relevant adaptations to courses and student counselling policies, in order support the target student group in risk of dropping out of the education. What are these students really experiencing? Further insights into causes may be investigated by introducing questions aimed directly at these groups of students, e.g. in course evaluations or other means.

It's not hard to imagine that these kinds of graphs will be part of any standard university dashboard in the future.



**Title:** Continuity, flexibility and accessibility of living labs through Virtual Reality

**Keywords:** Course development, Cross disciplinary courses, Digitalization of education

**Presentation format:** Presentation

**Stage of the project:** Early

**Authors:**

Elena Malakhatka<sup>1</sup> and Liridona Sopjani<sup>2</sup>

<sup>1</sup>KTH, EGI

<sup>2</sup>KTH, IPD

#### **Abstract**

Digitalization and data-driven science will drive fast innovation processes which will enable design and development of new technologies, products, and services in much more timely and resource efficient manner. Research integration from different disciplines through the use of advanced mediums such as virtual reality (VR) to explore and understand phenomena by bringing new layers to the scientific method - scientific data visualization, virtualization of research projects and experiments, and new methods of dealing with complexity as our social and technological systems become more connected and dependent on each other e.g. energy systems, transport systems, production systems etc.

A group of Ph.D. students at KTH is designing and developing the Virtual City Platform with the goal of doing research, education and scientific divulgation using VR as a mean to exploit the digitalization of KTH. The main focus at Virtual City Platform is Human-Machine-Environment interaction and data collection for behavioral analysis.

Virtual City Platform is a modular world composed of a common intro environment, the “virtual city”, and several “virtual rooms” for each scientific demonstrator. The Virtual city elements, such as virtual building (KTH Live-in-Lab), virtual mobility (KTH Mobility Pool) and virtual factory (KTH Production engineering Lab) will be built first as it is the main application, with software engineering techniques that allocate space in the projects for an infinite number of rooms to be added. The nature of a demonstrator is to embed a participatory experiment in collaborative virtual environments (CVEs) with the opportunity to extract data from the interactive cases. Experiments are based either on multi-user tasks or single user task.



**Title:** Continuous assessment – Time and effort well spent for students and teachers?

**Keywords:** Assessment, Student learning, Teaching and learning in higher education

**Presentation format:** Poster

**Stage of the project:** Mid stage

**Authors:**

Hans Havtun<sup>1</sup>, Viggo Kann<sup>2</sup>, Ninni Carlsund<sup>3</sup> and Lasse Wingård<sup>4</sup>

<sup>1</sup>KTH-ITM School, Energy Technology

<sup>2</sup>KTH-EECS School

<sup>3</sup>KTH-SCI School

<sup>4</sup>KTH-ITM School

**Abstract**

### **Background and purpose**

Continuous assessment has been used for many years in higher education. However, as more and more teachers are using it in their courses, the risk of over-burdening students is increasing. Moreover, implementing continuous assessment may also increase teachers' already large workload.

Even though many teachers at KTH claim they have continuous assessment in their courses, only very few have implemented truly *continuous assessment* (which in this context are courses with assessment tasks arranged during the duration of the course, which – if passed – yield a pass on the course without the student taking part in any final assessment *concluding* the course).

Most courses at KTH employ what we call *hybrid assessment* (courses with assessment tasks during the course that contributes to the score of the final assessment concluding the course). The contribution to the score of the final assessment is most often realized by some kind of bonus system, where achievements during the course yields points/merit added to the final assessment. There are however many different ways of implementing hybrid assessment and it does not need to be bonus-based at all.

Some courses at KTH are fashioned with *final assessment* (courses that lack assessment tasks during the course altogether, and only has one summative assessment task concluding the course). Although seen as the most resource-efficient way to assess students, this kind of approach may lead to surface-oriented learning which most university courses are trying to avoid as the knowledge is likely to be forgotten after some time.

Arranging courses with continuous and hybrid assessment naturally takes more teacher resources as

compared to final assessment courses. In this paper, we investigate a selection of courses employing continuous assessment, hybrid assessment, and final assessment. We compare pass rate, achievement rate, and teacher assessment workload in courses using the three categories of assessment.

### **Work in progress**

We interview teachers, and utilize course evaluations to find students' views of the different categories of assessment. We discuss what it would mean to KTH, its teachers, and its students if only one or two of the assessment categories were used throughout all KTH courses and programs.

### **Results and observations**

From evaluations of courses employing continuous assessment, a vast majority of the students express appreciation for the opportunity to pass the course before any final concluding assessment. One of the reasons given is that it reduces students' anxiety of failing the course. Some students further state that having already passed the course at the time of the final assessment, allowed them the possibility to explore aspects of the course that really intrigued them. On the other hand, students lacking an interest in the course subject area stated that they stopped participating and stopped studying in the course once a passing grade had been achieved. According to course evaluation data, this was mostly done in order to prioritize other parallel courses.

In courses using hybrid assessment, students are spending more time on their studies as compared to students in courses using final assessment. Students still need to pass a final assessment, but the hybrid assessment forces/encourages students to study to a greater extent. From course evaluations we have found that the amount of bonus points/merits given for passing assessment during the course may influence how students approach assessment. One way of encouraging students to participate in assessment tasks not directly yielding a pass on the course, is to show the students evidence of past students' performance. This type of motivation is useful, but not as effective as the awards offered in continuous assessment.

As is well known from literature, spending more time-on-task promotes both learning in general, as well as a deep-learning oriented approach. Therefore continuous and hybrid assessment should be promoted.

Being dependent on a final assessment to pass a course may cause unnecessary anxiety among students, an anxiety that is likely not to contribute to increased learning, and possibly leading to surface-oriented learning approaches.

### **Take-home message**

Continuous or hybrid assessment use more teacher resources, but in turn creates better learning environments for students and, more importantly, an increase in student learning.



**Title:** Does taking a course in supervision make you a better supervisor?

**Keywords:** Project-based learning, Teaching and learning in higher education

**Presentation format:** Presentation

**Authors:**

Niclas Hjelm<sup>0</sup>

**Abstract**

### **Background and purpose**

The course LH219V Supervision and Assessment of Degree Project Work in First and Second Cycle (3.0 ECTS), open for teachers at KTH, has 30-40 participants per year. We want to investigate if the course has lasting effects on the participants' supervision skills - does taking the course really make you a better supervisor?

The course is examined through active participation in four workshops and by a written report where the participant analyzes the degree project routines in his/her context and proposes areas for improvement and concrete actions/strategies for this. Lessons learned from the workshops can be put into practice immediately. The course coordinators will normally not know to what extent the actions/strategies proposed by the KTH faculty in the LH219V course reports are applied and put to practice after the end of the course.

### **Work done/work in progress**

In February 2019, a survey was sent to all participants (69) that completed the course LH219V in 2016-2018. The main areas for investigation were

- a) if the participants think their supervision skills has improved after taking LH219V.
- b) to what extent the actions/strategies from their final course reports have been implemented, and how those changes were initiated.

We also want to understand better the different roles and relations in relation to the participant's role in the degree project (examiner/supervisor/seminar leader/program coordinator/...)

### **Results/observations/lessons learned**

Main findings from the survey (N=21):

- i) Most participants (15) thinks their supervision skills has improved slightly, and 4 thinks their

supervision skills has improved a lot. Only one participant thinks his/her supervision skills has not improved.

ii) Actions/strategies from the final report are implemented in a majority of cases; the extent to which this is made is "Mostly" (5), "Partly" (10), and "Not at all" (6). About half of the participants (11) only act in the role of a Supervisor, a majority of those (7) replied "Mostly" or "Partly". This indicated that actions/strategies can be implemented even if you don't have formal mandate as an Examiner or a Program Coordinator (PA).

### **Take-home message**

Taking a course in supervision makes you a better supervisor, thinks over 90% of the respondents. Although some participants thinks that the final task is vague or a bit unrealistic, actions/strategies proposed in the final report, are (at least to some extent) implemented, for more than 75% of the respondents.



**Title:** Don't get stuck in the tool, use the method! - Lessons learned by teaching test driven program development

**Keywords:** Assessment

**Presentation format:** Poster

**Authors:**

Emma Riese<sup>1</sup>, Olle Bälter<sup>2</sup> and Vahid Mosavat<sup>1</sup>

<sup>1</sup>EECS, TCS

<sup>2</sup>EECS, MID

**Abstract**

## **1. Background and purpose**

Since 2014, we have embedded Test Driven Development (TDD) in an introductory programming course. TDD is common industry practice for developing code, and has also become a part of curriculums at different levels and proven beneficial in educational settings (Kollanus and Isomöttönen, 2008). The method itself is rather simple: you start with writing test cases for your program (what output you expect for certain input) and then you write code that fulfills these tests. In that way, the use of the TDD enables you to test your code immediately and throughout the development, in opposed to the more traditional way in which you first finish the code and then write test cases to verify it. Teaching this method in an introductory course would also enable students to use it in later courses and be well accustomed to the method when they graduate. Researchers that conducted a previous study on this recommends that TDD should be mandatory (Marrero and Settle, 2005).

## **2. Work done/work in progress**

TDD has during the years 2014-2017 been a mandatory part of an introductory programming course offered to non-computer science majors. The approach to teaching TDD has evolved and been a bit different each year. However, since TDD has been a mandatory part of the course, it was also part of what the students were assessed on, coherent with constructive alignment (Biggs, 1996). Making it part of the assessment was also believed to motivate students to use the method, since the assessments can make students take part in learnings situations they otherwise would not (Ramsden, 2003). Hence, the students were required to not only submit and present their code, but also their test cases, that had to be written in a standard tool, doctest, that was presented and explained during lectures. In 2017, all 64 students that presented their final assignment during the spring filled out a survey about their experiences with TDD and in addition, nine of the students were interviewed.

### 3. Results/observations/lessons learned

From the open-ended questions on the surveys and from the interviews, it became evident that many of the students had not understood nor used the method TDD, but had instead used the testing tool to create test cases when their program was already finished. They had handed in test cases since that was a requirement to pass the course, but they had forgotten all about the method. From these results, the lesson we learned was that even though our intention had been to make TDD mandatory, and we planned the assessment with that in mind, we had actually only made the use of the testing tool mandatory.

We did try to convince the students that using the TDD method would be beneficial in the development of the program, but failed. One of the benefits of TDD is for code maintenance, but the structure of our courses does not easily lend itself to requiring adjustments of a student project say six months after the first submission, especially for students who are non-CS majors.

### 4. Take-home message

When teaching your students a method through the usage of a tool, you need to make sure your students can distinguish between the method and the tool. You will also have to emphasize the method and plan the assessment in such a way that the use of the method, the process, is assessed. If the focus is only on the finished product, it will more likely be an assessment of how well the students used the tool and the students are at risk of neglecting the method altogether.

### References

- Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education*, 32(3), 347-364.
- Kollanus, S., & Isomöttönen, V. (2008). Test-driven development in education: Experiences with critical viewpoints. *Proceedings of the 13th Annual Conference on Innovation and Technology in Computer Science Education*, 124-127.
- Marrero, W., & Settle, A. (2005). Testing first: Emphasizing testing in early programming courses. *Proceedings of the 10th Annual SIGCSE Conference on Innovation and Technology in Computer Science Education*, 4-8.
- Ramsden, P. (2003). *Learning to teach in higher education* (2nd ed.). London: Routledge





**Title:** Effective Feedback for Faster Learning

**Keywords:** Course development, Digitalization of education, Pedagogical teaching tools

**Presentation format:** Workshop

**Authors:**

Olle Bälter<sup>1</sup>, Emma Riese<sup>2</sup> and Olga Viberg<sup>1</sup>

<sup>1</sup>EECS, MID

<sup>2</sup>EECS, TCS

**Abstract**

### **Background and purpose**

The Open Learning Initiative (OLI) at Carnegie Mellon University and Stanford University showed already in 2008 (Lovett, Meyer & Thille) that by using the OLI methodology, teaching and learning time could be reduced with 50% with maintained results. One key in this methodology is to use online questions with answer-dependent feedback. In this workshop we will work with you to formulate OLI-inspired questions for your course.

### **Work done/work in progress**

We have previously worked with online quizzes in several forms (Bälter, Enström & Klingenberg, 2013) and analyzed learning data from OLI courses (Bälter, Zimmaro & Thille, 2018). The online learning material where the questions and feedback is embedded is in campus courses used in flipped classroom settings. In 2017 we ran a pilot of preparatory course in programming based on a Stanford course with OLI methodology in the OpenEdX environment. During the fall semester 2018 questions with answer-dependent feedback was added to the course material in an online introductory programming course given in Canvas at KTH.

### **Results/observations/lessons learned**

While a full implementation of the entire OLI methodology requires infrastructure that is not in place at KTH yet (event handler, analytic engine), the actual learning for the students takes place in the interaction with the questions and their feedback and this part can already be implemented in Canvas at KTH.

### **Take-home message**

Well-formulated questions with forward focused feedback can dramatically speed up both teaching and

learning. This workshop brings that speed to your course with practical exercises based on your own course.

## References

O. Bälter, E. Enström och B. Klingenberg, "The effect of short formative diagnostic web quizzes with minimal feedback," *Computers and education*, vol. 60, no. 1, s. 234-242, 2013.

O. Bälter, D. Zimmaro och C. Thille, "Estimating the minimum number of opportunities needed for all students to achieve predicted mastery," *Smart Learning Environments*, vol. 5, no. 15, 2018.

M. Lovett, O. Meyer och C. Thille (2008). "The Open Learning Initiative: Measuring the Effectiveness of the OLI Statistics Course in Accelerating Student Learning". *Journal of Interactive Media in Education*, 2008(1), 1–16.



**Title:** Engineering ethics: an analysis of the teaching methods and impact on student at KTH Royal Institute of Technology in Stockholm

**Keywords:** Teaching and learning in higher education

**Presentation format:** Presentation

**Stage of the project:** Mid stage

**Authors:**

Antonio Maffei<sup>1</sup>, Per Johansson<sup>1</sup> and Eleonora Boffa<sup>1</sup>

<sup>1</sup>ITM, IIP

**Abstract**

### **Background**

Awareness about Ethics is one of the most important learning outcomes required by governments as condition to approve the work of higher education that form students in technical disciplines. The following translated extract provides the indication about the required learning outcome in the domain of ethics for technical graduates in Sweden:

- ability to make judgments taking into account relevant scientific, social and ethical aspects (high level of understanding “evaluate” in [1])
- show awareness of ethical aspects of research and development work: (vague formulation that could be hinting at several levels of understanding, most likely “analyse” or “apply”)

This freedom of defining the objectives in teaching ethics means there is not consensus about the best way of doing it. [2] have identified and characterized the three most popular delivery models in the domain of engineering:

Teaching ethics across the curriculum

Joint venture model/team teaching approach

Standalone course

### **Method**

This paper presents the result of two surveys: the first survey[1] was carried on to establish which were the teaching methods used for engineering ethics at KTH.

The second part of this survey[2] aimed at measuring the actual awareness about engineering ethics of

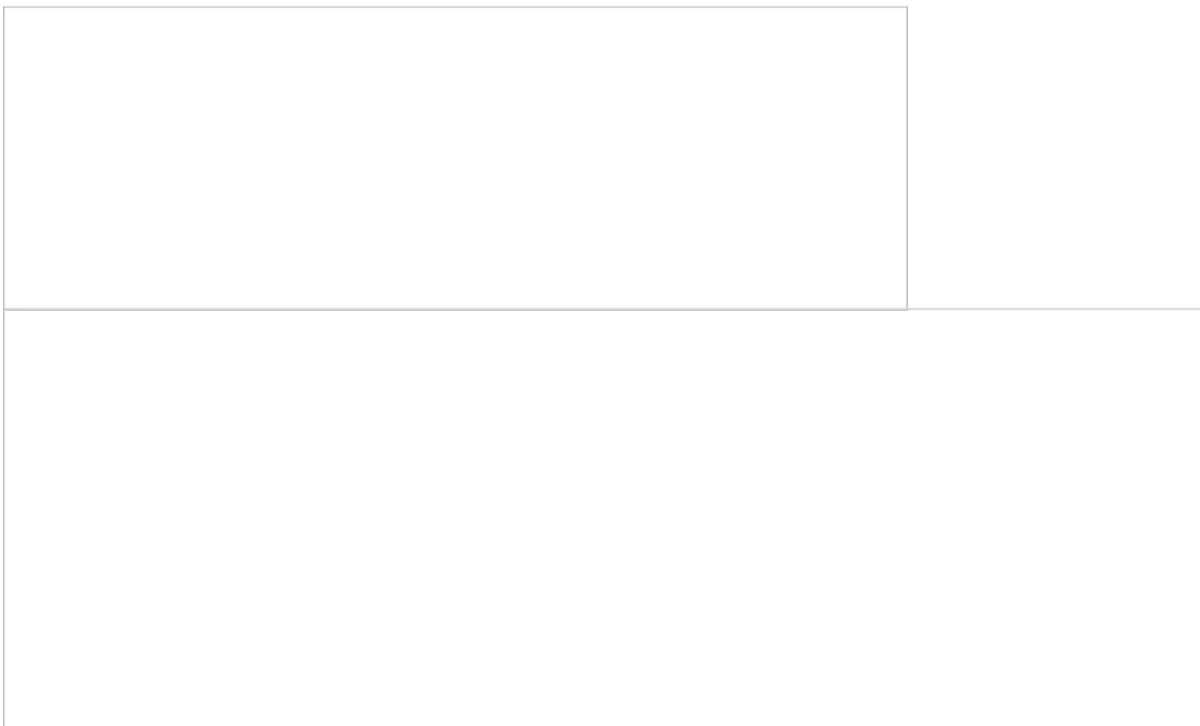
KTH students. In order to do so the research team selected 15 different real cases from the online database of the National Science Foundation[3].

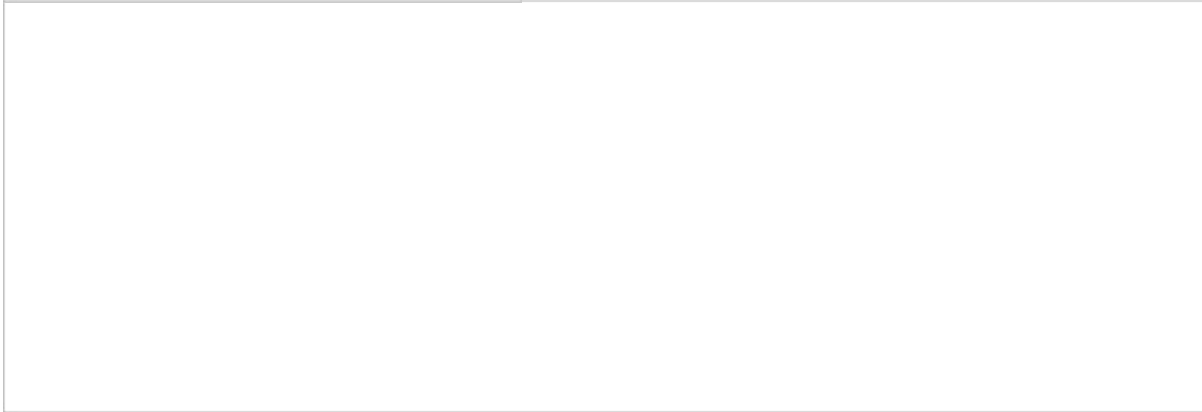
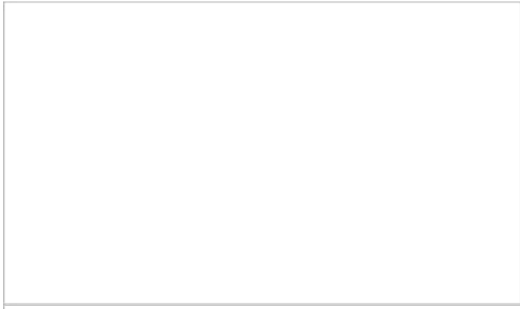
### **Result/observation/lesson learned**

The first survey on the program leader collected 31 responses. Graph 1 shows the distribution of teaching methods among the respondents.

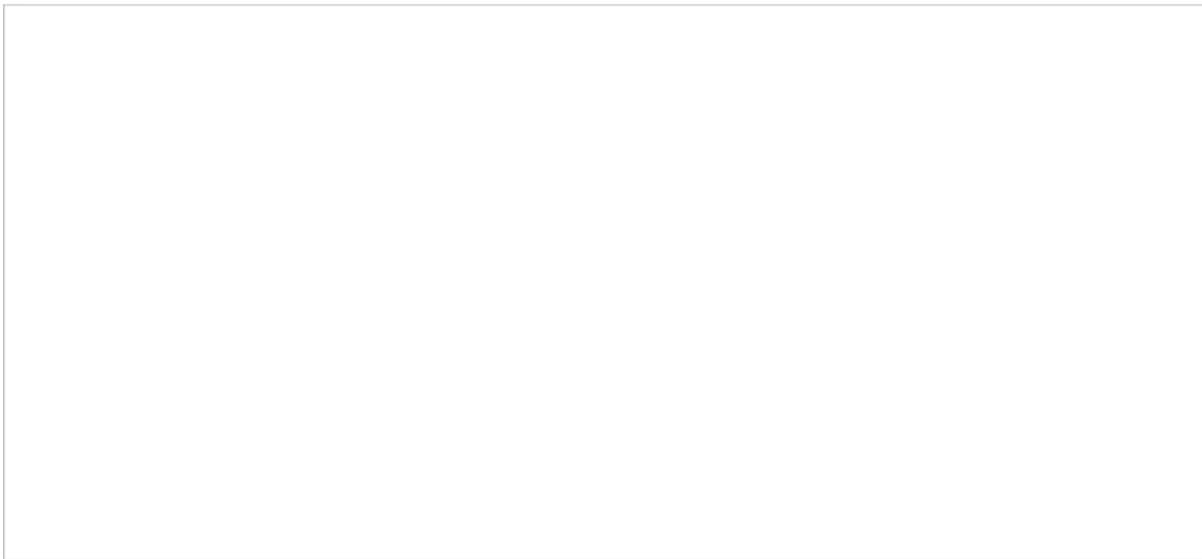


The following Graph 2 and 3 show respectively the average results and distribution of the answers to the question about the perceived level of awareness about engineering ethics of students entering and finishing the programs led by the respondents.





The second part of the survey was answered by 114 students in the first, second and third cycle. The following Graph 4 shows the years students have studied engineering when taking the survey.



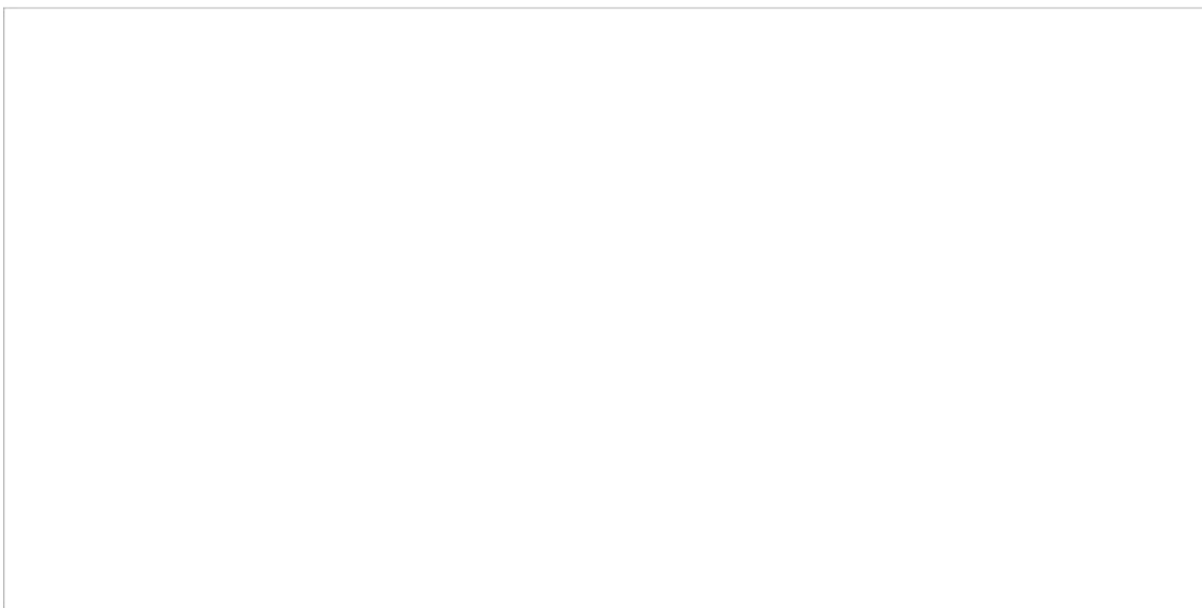
The following Graph 5 shows the percentage of correct answer in the sample.

---



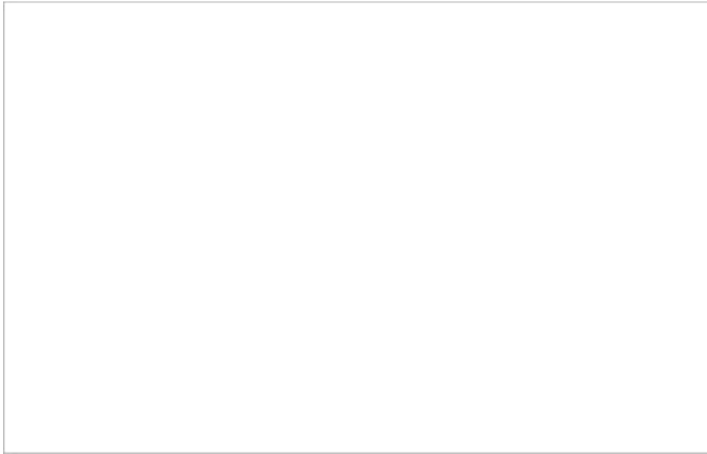
The scissor is between 30% and 90% of correct answer, with a general average of **62% correctness**.

The following Graph 8 shows the “participation in ethics education” distribution of the sample



As almost all the engineering programs at KTH (96% according to the above the survey) include formal education in engineering ethics this division reflect whether or not the respondent had encountered this ethic related learning activity in his/her studies yet. The following Graph 9 shows the distribution of correct answers according to this parameter.

---



This is a surprising results because it basically can be interpreted as if KTH education on ethichs only impact 4% positively the student perception. The following Graph10 and Graph 11 shows the separate age trends for the two groups respectively. The comment on this is this reinforce the idea that KTH has a really marginal impact on our student. In addition to that a shift between 60% and 64% before and after education is much lower than the one envisaged by the program leaders in the first part of the survey 48% to 75%! Another signal that the education in Engineering ethichs is not there where KTH wants it

### **Take-home message**

Even if specifically requested KTH does not affect significantly the student perception of engineering ethichs. One of the reason for this lack of aligning can be the vague formulation that the learning outcome for enigneering ethichs at program level is formulated. So this work recommend to address this formulation making it clearly pointing towards the best mode of teaching. This will require a structured centralized approach and suitable resources.

### **References**

- [1] B. S. Bloom et al. "Taxonomy of educational objectives: Handbook I: Cognitive domain,"
- [2] J. Li and S. Fu, "A systematic approach to engineering ethics education," *Science and engineering ethics*,
- [3] A. W. Chickering and Z. F. Gamson, "Seven principles for good practice in undergraduate education,"
- [4] F. Marton and K. Trigwell, "Variatio est mater studiorum," *Higher Education Research and Development*,
- [5] G. Weybrecht, "How to Teach Students to Be 'Ethical',"



**Title:** Fact or Fiction? – Citation Categories and their Use Cases in Thesis Bibliographies at KTH

**Keywords:** Assessment, Cross disciplinary courses, Student learning

**Presentation format:** Presentation

**Stage of the project:** Finished

**Authors:**

Gunnar Malm<sup>1</sup>

<sup>1</sup>KTH Royal Institute Of Technology, Electronics

**Abstract**

## 1. Background and purpose

Since the first level (bachelor) thesis was introduced in the degree programs at KTH students are exposed to scientific writing at a relatively early stage in their education. A key element of scientific writing is an efficient use of citations i.e. references to published scientific or technical work in their subject area. From a teacher perspective, many first level thesis reports showed poor quality in this respect. Therefore, development a well-defined scientific method was highly motivated, to facilitate a quantitative or empirical study of this observation

## 2. Work done

In my work a method, based on so called context analysis, was proposed and used to study student behavior in first level thesis reports, regarding their use of citations. The objective was to look at categories of in-text citations and to find evidence, supporting a hypothesis, that student use of citations show distinct patterns. These patterns could reflect that they rely too much on facts and show too little evidence of learning, regarding synthesis from reliable and valid scientific sources, in their respective technical domain. The citation category method, proposed by me, starts from an a priori set of “use cases” or “in-text citation categories”. Based on these categories all citations could be coded for further statistical analysis.



### 3. Observations

The empirical results were based on ten first level (BS) reports. These were selected to represent programs at the different schools at KTH. A full search was done in DiVA for the time span June 2013-June 2015 and the selected reports are a random sampling of the 1300 reports, found in the database.

The results clearly points towards a use of citations, where “presenting a fact” is emphasized over most other use cases. The use of a citation to “introduce or discuss contrasting views” or “in support of an argument” is seldom observed. On the other hand, the bulk of the in-text citations are used to shape the background survey. In extreme cases the whole thesis structure is based on the ideas, found in the studied literature. Finally, it is found that the reliability and validity of sources is sometimes commented upon by the thesis authors.

### 4. Take-home message

As students are exposed to scientific writing, for the first time, they display a pattern of using citations mainly to present facts. They have not yet learned that citations have many other valid use cases, such as introducing or discussing contrasting views. Students need training and exposure to scientific writing, in order to develop and broaden their use of citations. A natural extension of my study would be at the second level, since these students have more training in scientific writing.



**Title:** Formative feedback in basic mathematics courses

**Keywords:** Assessment, Course development, Pedagogical teaching tools, Teaching and learning in higher education

**Presentation format:** Presentation

**Authors:**

Maria Shamoun<sup>1</sup> and Niclas Hjelm<sup>1</sup>

<sup>1</sup>CBH, Biomedical Engineering And Health Systems

**Abstract**

### **Background and purpose**

As a result of student's opinions in the course survey, expressing difficulties in understanding assessment criteria, a new learning activity was introduced in two mathematics courses at Technical Preparatory Year, Campus Flemingsberg. In class, students are supposed to evaluate teacher-provided solutions to typical exam questions. The solutions may be incomplete or contain errors; we call them *fictitious student solutions* (FSS) as they can exemplify common errors or misunderstandings occurring at the final exam. The student's task is to

- a) Use rubrics to assign scores to the proposed solutions
- b) Improve the proposed solutions

A quantitative study comparing student performance where one student group studied correct and another group studied incorrect examples indicates that studying incorrect examples is more efficient (Booth et al, 2013[1]).

### **Work done/work in progress**

The learning activity *evaluation of fictitious student solutions* was developed by the authors in 2017 and has in 2018-2019 also been used by two other colleagues. (The courses are given every semester, in two or three parallel groups, often with different teachers in spring and fall.) The number of occasions has increased in 2018-2019 as we saw indications of improved learning.

It is possible to add elements of peer learning to the sessions by asking the students to assign scores and give feedback to their peer's solution to the given problem, although we haven't tried this yet. Another suggestion for development, building on variation theory, is to use more than one solution for each problem, thereby exemplifying different levels of quality in the proposed solutions.

### **Results/observations/lessons learned**

A small qualitative survey has been conducted in 2019, where both parallel groups, having different teachers, participated. The survey shows that the students think they learn a lot from this learning activity. The students were asked to respond to the statement "Today's exercise in evaluating fictitious student solutions was...(1 = Not instructive at all, 5 = Very instructive)". The outcome was an average of 4.51 (N=35). (In group A the average was 4.55 (N=20), and in group B the average was 4.47 (N=15)) The authors have observed increased student activity during the sessions, and a reduced frequency of some types of errors at the final exam. The two other colleagues that have used FSS have expressed that students were activated, and that they will use FSS in coming course rounds. The authors are considering to use FSS in basic physics courses also.

### **Take-home message**

Using *evaluation of fictitious student solutions* is a method that is easy to implement, and there are indications that it may result in improved learning. It can also be combined with peer learning/evaluation.

### **References**

[1] Booth, J.L., Lange, K.E., Koedinger, K.R. & Newton, K.J. (2013). Using example problems to improve student learning in algebra: Differentiation between correct and incorrect examples. *Learning and instruction*, 25, 24-34.



**Title:** From Immigrant to Employee How SDA Paves the Way at KTH

**Keywords:** Course development, Sustainable development , Diversity in the classroom, internationalization, Project-based learning

**Presentation format:** Presentation

**Stage of the project:** Mid stage

**Authors:**

Marcus Dicander<sup>1</sup>, Richard Glassey<sup>2</sup>, Philipp Haller<sup>2</sup>, Dena Hussain<sup>1</sup>, Sissi Rizko<sup>3</sup> and Mattias Wiggberg<sup>3</sup>

<sup>1</sup>EECS, CST

<sup>2</sup>EECS, TCS

<sup>3</sup>ITM, Indek

**Abstract**

The Software Development Academy (SDA) project started in Spring 2016 as a collaboration between KTH (Mattias Wiggberg, Philipp Haller) and a recruitment agency, Novare Potential(NP) (Farzad Golchin). The goal was to help refugees find employment within the IT sector. Despite the demand for talented IT workers, and the potential compatible talents of the newly arrived, there are still invisible barriers to finding employment. Thus, the idea was to combine the reputation of KTH, with the networking ability of NP, to break through these barriers.

The means to achieve this was to deliver an intensive three month education on site at KTH. In parallel, NP refined the participant profiles, applications and interview technique, before presenting them to clients in their network. The first iteration took place in 2017, resulting in 91% of 30 participants finding employment following the programme. This combination of education and networking exceeded our expectations in terms of the results achieved and three important themes have emerged.

Delivering Intensive Education: The participants are expected to treat the experience as if it were a job, and turn up every day from 9am to 5pm. This creates a pressure, but we have been continually surprised how well they cope; balancing study with the rest of their lives. For teachers, it is also intense, and the daily delivery of education can be tiring. However, a very convivial sense of community emerges between students and teachers, and is sustained throughout the programme. The intensity also has implications upon practical matters, such as the teaching environment. Early iterations made use of a converted server room, laid out as a traditional rank and file classroom, but was not fit for flexible teaching arrangements, such as group work. Today we use a new space that affords flexible clusters of

desks and provision for group work, which is much better suited to the mission. A further implication of the intensity is how important it becomes to continuously assess and provide opportunities for feedback. The experience of three iterations has led to the development of an agile and novel means of assessing experience, confidence and knowledge on a weekly cycle. Despite the advances, the teaching burden and dependency is still an ongoing challenge and something we are attempting to improve by innovating in our teaching methods.

**Participant Diversity:** Whilst the original focus was on refugees, this has widened to immigrants struggling to find work in Sweden. 32 different nationalities have been represented thus far. The gender ratio in the current iteration was 60% female; typically unheard of in STEM subjects in western countries. This was a complete phase shift for teachers used to seeing the inverse or worse at KTH. As a consequence, the classroom discussion is more balanced and not biased towards one group. Age diversity is a feature, where age-groups are blended together in the classroom. Some have completed studies and are looking to start their career, whilst others are returning to work after devoting time to family and other matters. This is also reflected in previous work experiences and degrees, which varies a lot among the participants, some having completed degrees in computing and others having no formal background in IT, but simply the desire to learn. Despite the cultural, gender and age diversity, we still face fundamental questions about how to integrate diversity training into the experience, as having a diverse group does not ensure that all individuals reflect this in their own attitudes.

**Lifelong Learning at KTH:** Lifelong learning challenges the normal academic routine. Over time we have gathered experience on how to bring together different groups, academics, administrators, participants and recruiters and work on a mission that will continue to grow in importance for society. While SDA has been internally praised as a positive initiative towards this mission, it tends to face tensions when balancing between traditional routines and manners of academic life with finding new and creative ways of delivering lifelong learning. Setting up the project is an experimental journey and a lot of knowledge and experience has been created already which easily can be generalized and hence be a contribution for other initiatives.

SDA is funded (totally €3M) by Wallenbergstiftelsen, European Social Fund and KTH.



**Title:** Harmonized Supervision of Degree Project Work

**Keywords:** Peer learning, Student learning, Teaching and learning in higher education

**Presentation format:** Presentation

**Stage of the project:** Mid stage

**Authors:**

Milan Jocevski<sup>1</sup>, Adil Mardinoglu<sup>1</sup>, Dilian Gurov<sup>1</sup>, Tage Mohammadat<sup>1</sup> and Paolo Monti<sup>1</sup>

<sup>1</sup>KTH Royal Institute Of Technology

**Abstract**

### **Background and purpose**

Effective supervision practices are vital for the educational and professional development of students, for continuous growth of supervisors, as well as for the development of respective scientific fields. In light of different learning styles (Taylor & Beasley 2005) and having in mind the time resource constraints of supervisors, it is not easy to point out the best pedagogical approach to supervision that maximizes the learning experience. In addition to the traditional *individual supervision* (IS) style there are other options (e.g., *group supervision* (GS) and *peer supervision* (PS)), which offer certain advantages. These three styles do not exclude each other, but can rather be combined to complement each other's strengths.

In order to maximize the effectiveness of combining multiple approaches, it is essential to understand its advantages and disadvantages. Based on a survey of different experiences among supervisors and students collected from different Swedish education institutions, our paper suggests ways to optimize the supervision processes. Moreover, we call it *harmonized supervision*, and believe that it would save time and effort for the supervisors, and help students to overcome the individual limitations of each supervision style.

### **Work done/work in progress**

In order to study the preferences of students and supervisors with respect to IS, GS, and PS we conducted a survey among faculty members as well as former students at four higher education institutions (HEIs), where our goal was to aggregate their experiences and learnings. The sampling was done in two-stages. First, we selected the HEIs. Due to convenience and connections to specific

departments at given HEIs that the authors had, we then sent e-mail invitations to both students and supervisors at these HEIs. In the second stage, through a voluntary process, respondents from both groups took part in the survey. Questions in the survey were inspired by the previous experiences of the authors, and traditional supervision approaches of the affiliated institutions. We asked informants about their experiences, and what they believed were advantages and disadvantages of each of the experienced supervision styles. Finally, data was analyzed using descriptive statistics and qualitative analysis of open-ended questions. Basically, we looked into which style was used the most and in which situations, as well as compared different answers that spoke in favor and against each style.

### **Results/observations/lessons learned**

It is interesting to note that supervisors and students had similar views with respect to IS, GS, and PS. In terms of IS “lack of different perspective” and “limited flows of new idea/opinions” are among the drawbacks highlighted by both supervisors and students. Interestingly enough, a solution to these issues is readily available among the benefits of GS and PS, i.e., “New ideas for solving problems” and “Diverse feedback”. This observation leads us to conclude that combining IS, GS, and PS in a *harmonized supervision* approach. By harmonized supervision we refer to an approach where GS and PS are used as the basis, and where IS is used only when needed.

### **Take-home message**

Regardless of the choice of the supervision method, one can note that a mixture of style is more effective depending on the learner’s phase, which can be broken down in two main stages. In the initial phase, the supervisor exercises a more structural and contractual style. For instance, the supervisor acts as a teacher explaining the research method and the student performs it on a step-by-step basis. The next stage is the training phase, where the supervisor can give the student more formative assessment support and feedback to develop student’s skills until a certain autonomy quality is achieved. Lastly, the learner becomes a master of the thesis topic and therefore becomes more independent. When considering supervision it is important to think about different levels of intellectual development and the social component of the learning process. At the second phase, i.e. training phase, the supervisor can adopt group or peer supervision. Engaging the students in peer and group supervision may be conducive to the creation of a more secure learning environment. However, it is essential to provide a constructive group constellation and complementing instructions for peers to maximize the learning outcomes in an efficient manner.



**Title:** How to lift the quality of bachelor thesis projects

**Keywords:** Course development, Pedagogical teaching tools, Project-based learning, Student engagement and motivation, Student learning, Teaching and learning in higher education

**Presentation format:** Presentation

**Stage of the project:** Finished

**Authors:**

Anita Kullen<sup>1</sup>

<sup>1</sup>KTH, Space And Plasma Physics

**Abstract**

### **Background and purpose**

As course coordinator for the bachelor thesis course for electrical engineering students at KTH, I was the main responsible for the development of this course since 2011. Usually, about 100 students participate from several KTH schools, including electrical engineering, physics, vehicle engineering and energy & environment students.

My task was to implement the course goals given in “högskoleförordning” into a given rudimentary course structure. These goals cover a large range of topics including the ability to gather knowledge, work in groups, plan and perform a project, give qualified feedback on other’s work, be able to present the work in written and oral form, and to be able to critically judge the work from a broader societal and environmental perspective.

Several years of course development resulted in a course design that contains many deadlines, obligatory seminars, work plan, teamwork exercise, ethical and environment analysis of the projects context, written and oral review, project report and oral presentations at a common presentation day.

The main purpose of the course development was to enhance the quality of the written and oral presentations. In addition, the course structure should help to streamline the student’s work to enable them to finish in time, but also to save the student time by teaching them many practical details such as work plan, review and report structure, how to cite and produce a reference list, how to argue in an ethical discussion or how make a good ppt-presentation.

### **Work done**

To enhance the quality of the course, the following has been implemented:



**Motivating the students.** This is done by making their work more visible through a common presentation day, collecting all reports in a book and offering them snacks at kick-off and presentation day.

**Tailor-made seminars given by teachers from our school.** All seminars have been developed with help of experts of the different fields (philosophy researcher, sustainability professor, KTH library) but are given by teachers from our school, as they know what the students need to learn to succeed with their bachelor thesis work.

**Internal course-points for each different course goal.** All course goals are graded with internal course-points to guarantee that the corresponding exercises are been taken seriously, and to ensure that the students reach these goals.

**Feedback loops** for work-plan, ethical and environmental reflection, and report. To guarantee that the supervisors/teachers/fellow student's feedback results in improved texts, the manuscripts need to be handed in twice, the second time including the reviewers suggestions.

**A strict time frame** with several sub-deadlines is given. This helps the students to stay on track and finish in time. The course evaluations show, when deadlines are clearly motivated and communicated, they do not cause any problem, but help the students to finish the course in time.

**Information about course** content and structure. Students are informed about the project selection at an information meeting in autumn, and about the course structure and grading rules in a kick-off meeting at course start in January. In addition, there exists a detailed course-PM and a clearly structured Canvas homepage where all material is uploaded. This helps the students to understand how the course is structured and what is expected from them, as well as reduced the time for unnecessary teacher-student communication about course rules.

### **Lessons learned / Take home message**

From this course development I learned about the importance of clear structures and rules in large courses. This both saves time of the teachers and reduces the stress level of students.

Second, I discovered through the years that to enhance engineering student's soft skill skills, they need input in several different ways a) a **clear motivation** why something needs to be learnt (necessary to pass the course, and useful for upcoming courses and future career), b) **good examples** from previous course rounds and c) **cookbook recipe-style instructions** for workplan, review, report, oral presentation, and d) **feedback** before handing in the final version/doing the final presentation. This helps the students to deliver written and oral presentations with high quality even if they have to do this type of presentation for the first time.



**Title:** KTH's strategy for e-learning

**Keywords:** Digitalization of education

**Presentation format:** Workshop

**Authors:**

Stefan Stenbom<sup>1</sup>, Joakim Lilliesköld<sup>2</sup> and Arnold Pears<sup>1</sup>

<sup>1</sup>ITM, Learning

<sup>2</sup>EECS

**Abstract**

## **KTH's strategy for e-learning**

### **Background and purpose**

KTH's vision for the year 2027 is that "the virtual campus is as important as its physical equivalent" (KTH, 2011). In the context of education, following the notion of Biggs & Tang's (2007) Constructive Alignment, this means that the courses and programs at KTH by 2027 are conducted with learning activities and assessment activities that are equally in the physical and digital learning environment. This calls for a blended learning approach with the "organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies" (Garrison & Vaughan, 2008).

### **Work done/work in progress**

During the last five years, KTH has made increased investments in e-learning. These investments include individual projects at different schools, switching production systems for KTH courses (Learning management system) from Bilda to Canvas as well as educational development projects. KTH has also invested in Massive Open Online Courses (MOOCs) where KTH courses are brought online and distributed to anyone with an internet connection via the EdX platform. In 2019, the MOOC-initiative will reshape into a digital course production resource that will co-construct courses together with teachers' for all different types of education at KTH. Along with this, a project is formed around digital examination and the result of the digital course information will be released. In KTH president's decision regarding e-learning 2019 (V-2018-1020), the steering group for educational IT was given the task to present a long-term strategy for the work in e-learning with the aim to reach the goal in the vision by June 1, 2019. The authors of this abstract are the teachers that are members of the steering group for educational IT.

### **Results/observations/lessons learned**

The aim of this workshop is to discuss KTH strategy for e-learning. The workshop will start with a short presentation of the current state regarding e-learning at KTH by the authors. This will then be followed by an open discussion regarding the vision of a blended learning institution, what strategic initiatives that the participants think are needed, and potential thresholds.

### **Take-home message**

The authors' intentions are that the result of this workshop will influence the long-term strategy for e-learning.

### **References**

Biggs, J.B. & Tang, C.S. (2007). Teaching for quality learning at university: what the student does. (3rd ed.) Maidenhead: McGraw-Hill/Society for Research into Higher Education & Open University Press.

Garrison, D. R., & Vaughan, N. (2008). Blended learning in higher education. San Francisco, CA: Jossey-Bass.

KTH (2011). Vision 2027.