Titel: Breddat deltagande genom “Supplemental instructions” i gymnasieskolan

Nyckelord: Supplemental instructions Breddad rekrytering Matematikundervisning Samverkan

Presentationsformat: Presentation

Projektets fas: Tidig

Författare:

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Syfte och bakgrund

Supplemental instructions (SI) är ett framgångsrikt koncept både internationellt och på KTH. Det används framförallt i kurser i matematik på tex. på civilingenjör- och lärarprogrammet (CLGYM), teknisk fysik och farkost på KTH. Metodiken är dock användbar i alla ämnen.

Lund är europeiskt centrum för SI-pass och där har man utvecklat en verksamhet för gymnasier i regionen (1). SI-ledare från Lunds Tekniska högskola åker till gymnasierna i regionen och har SI med gymnasieelever (2). Syftet med detta är bla att stärka kompetens, samverkan, genomströmning och inkludering (3, 4).

Regionerna runt Skåne vill utöka verksamheten och vi hoppas nu att KTH kan gå i framkant och verka för “Breddad rekrytering i Stockholmsregionen” genom att starta upp en regional SI plattform i samarbete med region Stockholm.

Under läsåret 19-20 har vi på KTH haft en pilotverksamhet där SI-ledare från KTH åkt ut i 2 gymnasieskolor i Stockholmsregionen. SI-ledarna har hållit SI-verksamhet för gymnasieelever främst i matematikkurser.

Syftet är:

Ökat lärande i svåra kurser för gymnasieelever

Breddat deltagande i högskoleutbildning, framförallt för elever från socioekonomiskt utsatta områden,

Marknadsföra och sprida information om KTH och dess utbildningar

Öka samverkan mellan KTH och gymnasieskolorna i syfte att tex. hitta VFU-platser

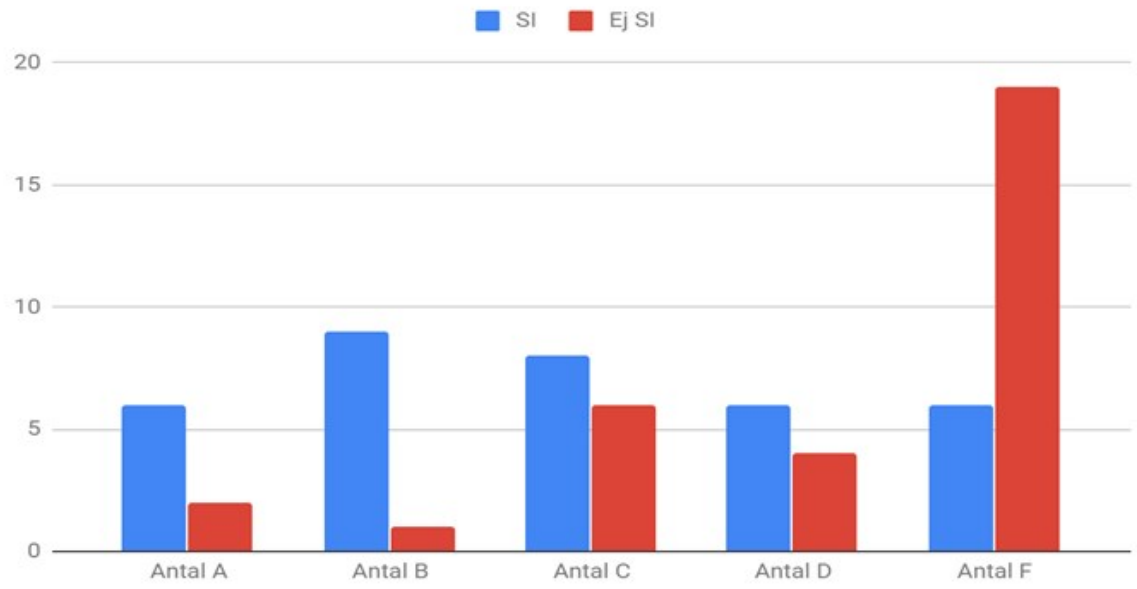
Genomfört arbete/arbete på gång

På civilingenjör- och lärarprogrammet har SI framförallt använts på kursen i Diskret matematik, två SI-ledare har hållit pass en gång i veckan under vårterminen för studenterna i kursen. Resultaten på studenternas tentamina insamlades.

På Blackebergs gymnasium höll en SI-ledare pass om matematikkurser för elever på natur- och ekonomiprogrammet, och synpunkter från eleverna insamlades. Vi samlade också in reflektioner från lärare och metodkursledare.

Resultat/observationer/lärdomar

I figuren nedan visas betygsresultat för studenterna i kursen Diskret matematik, KTH, VT2018. De blå staplarna representerar antal studenter som varit med på SI-aktiviteter under kursen, de röda staplarna representerar studenter som inte varit med på SI. Man kan tydligt se att studenterna som deltagit i SI fått ett högre betyg jämfört med dem som inte deltagit i SI-aktiviteter.



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Utvärdering av pilotprojekt i gymnasieskolan

SI-passen schemalades enlig följande:

Elever från 2 klasser bjöds in till SI-pass 1 timme per vecka under fyra månader.

De delade in i mindre grupper om 10-15 elever. Första delen i mötena var interaktiv,, sedan arbete i grupp/par. Aktiviteterna under mötena varierades i enlighet med SI-metodiken. Passens innehåll matchade innehållet i den ordinarie undervisningen

Utvärdering: Elevers tankar om SI

“Jag har fått otroligt mycket hjälp under dessa passen som jag vanligtvis inte får på de ordinarie lektionerna”

“När man tillsammans två och två har fått lösa uppgifter har varit bra tycker jag eftersom man kan bolla idéer mellan varandra och lära sig av varandra. Gemensam presentation på tavlan har också varit till stor hjälp, det har

varit superbra”

“Jag har lärt mig mer förståelse inom matten o fler strategier hur man ska tänka vid olika uppgifter”

SI-ledare och metodkursledares reflektioner

Det var svårt att hitta bra tider för SI-passen i elevernas schema, vi var helt i händerna på lärarna. Alla elever kom inte eftersom skolan inte ville göra passen obligatoriska. Närvaron blev ändå hyfsad eftersom elverna upplevde SI-ledaren som mycket bra.

Budskap

SI leder till bättre resultat hos KTH-studenter

SI stöttar gymnasieelever i svårare matematikkurser.

Det varierade arbetssättet ger eleverna möjlighet att identifiera olika sätt att lära och

vad som passar dem själva bäst.

SI-passen bör vara obligatoriska eftersom annars bara de mest motiverade eleverna deltar.

Kontrakt med gymnasieskolan där SI-ansvariga lärare får tid och schemaläggning av pass är obligatoriska bör skrivas.

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ISSN 1948-5476, 2012, Vol. 4, No. 3 (2012). Kan hämtas på URL: http://dx.doi.org/ 10.5296/ije.v4i3.1826

Title: Question-based learning with digital support in introductory Python programming courses

Keywords: Digital lärmiljö, Blended learning, Kursutveckling, Pedagogiska verktyg för undervisning

Presentation format: Presentation

Stage of the project: Mid stage

Authors:

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Background and purpose

In 2008, the Open Learning Initiative (OLI) at Carnegie Mellon University (CMU) showed that a digitally supported Question-Based Learning (QBL) methodology could reduce learning and teaching time by 50% in a university Statistics course, with maintained learning outcomes (Lovett, Meyer & Thille, 2008). We have repeated this study at KTH with a 25% learning time reduction and maintained learning outcomes (Bälter, Glassey & Wiggberg, 2021) on the Software Development Academy students (Wiggberg et al., 2021) at KTH. However, the QBL methodology remains to be tested on campus students at KTH.

Finished work/ongoing work

Over the summer 2020, we developed online QBL material for introductory programming courses in Python, and tested it during the fall 2020 on four course offerings at KTH with close to 500 students, whereof 200 (M), 60 (CL), 80 (Indek) and 120 (F) students. As these courses have been given in the same format to the same cohorts of students for several years, we will be able to compare throughput, grade average and course evaluations. However, these courses run until the end of study period 2 (January 2021), and we will not have data on a large scale until then.The ongoing COVID-19 pandemic also makes comparisons between fall 2019 and 2020 difficult, but we will also be able to compare another Python course (for Open) that did not use the QBL material to estimate how much the pandemic plays into the data.

Results/observations/lessons learned

The M and CL courses both used the learning material in a flipped classroom setting (the students worked with the learning material before the corresponding lecture, that was based on the feedback from the questions the students answered), while Indek and F/TM used the material as extra learning material. The data we have gathered so far comes from communication with students. The course representatives at M claimed that the QBL material was "great" and asked that the teacher-led tutorials (övningar) should be replaced and turned into student-led Q/A sessions (frågestunder). The Indek students asked to have the quizzes in the learning material reset so that they

could reuse them as a preparation for their midterm exam. In the course for the CL-students (Engineering and Education) a short Zoom poll was distributed mid way through the course, at the end of the QBL material. Of the 50 students who answered, 40% claimed QBL was "Much better than traditional lecturing". In addition, ⅔ of these teachers-to-be would like to attend more courses taught with the same methodology.

Take-home message

How does QBL with online support work at KTH? The answer will be revealed at SOTL 2021. So far, we have noticed that the OLI material has proven to be very flexible for both flipped and traditional learning, which indicates that it would work for many teachers at KTH, and help those who want to switch to a flipped delivery method. The studies we already have managed to perform indicates that the methodology sits well with the students.

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O. Bälter , R. Glassey & M. Wiggberg (2021): Reduced learning time with maintained learning outcomes. Accepted for publication in SIGCSE TS 2021 Computing Education Research.

Mattias Wiggberg, Elina Gobena, Matti Kaulio, Richard Glassey, Olle Bälter, Dena Hussain and Philipp Haller. (2021): Effective reskilling of foreign-born persons at universities - The Software Development Academy concept. Submitted to IEEE Access.

Title: Space as a pedagogical resource

Keywords: Visualize learning methods in classroom, Student centerd learning, PBL - dialoge , Highflex classrooms - Flexibility and technical equipment

Presentation format: Presentation

Stage of the project: Mid stage

Authors:

Marika Strömberg[1]

[1]GVS

Background and purpose

The knowledge that spaces that are designed flexible to shape areas where theories and methods are applied, tested and discussed in groups, like the ALC model is what I tried to apply through this piece. Visualize how a space can support collaboration and student centered learning.

The goal is to redesign lecture halls at KTH and support KTH’s efforts to change teaching spaces and media from “one-way delivery systems” to collaborative spaces that enhance blended learning metods like ALC, PBL and after Covid-19 more digital possebilities in a Highflex-classroom.

The" lecture"is designed to activate and make the participants interact i discussions of their own experience of space as a recourse in teaching and learning. The choices of methods as break-out discussions and Campus tour is made to allow the participants to collaborate and share experiences. If this is possible in March 2021??

The participants experience of teaching is vital.
The role as a teacher in this "lecture" is to introduce the participants to space/the classroom and motivate them to try-out and see possibilities in the room.

In collaboration with Anna-Karin Högfeldt at STEM we are trying to find time for a development of the KTH Campus learningspaces.

Finished work/ongoing work

Participated in LH217VHT201 Högskolepedagogik where my work is made.

As a projectmanager at Retailgroup at GVS I´m responsible for the development of all educational areas at KTH. I collaborate with representatives and referencegroups from Teachers, Pedagogical experts, IT-department at GVS, Akademiska hus and the Infrastructure dep. at KTH/GVS.

Results/observations/lessons learned

Lessons learned after 4 yrs at KTH is that to learn you as a teacher has to experience the space IRL.

Take-home message

The design in a room clearly communicates what is possible and what behaviour is allowed (Gitz-Johansen, Kampmann & Kirkeby,2005).

The design of a space influences the actions taking place in the room. Space can be a part of a teacher´s concious didactic design.

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Title: Collaborative, active and reflexive learning: Facilitation techniques and supportive spaces

Keywords: Collaborative and reflexive learning, Student engagement and motivation, Learning spaces, Sustainability transition challenges

Presentation format: Presentation

Stage of the project: Finished

Authors:

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[1]ABE, Architecture And The Built Environment

Background and purpose

Addressing complex sustainability challenges requires the ability to build upon the diversity of perspectives and problem framings, cross-silo collaborations, and continuous learning and adaptation. These abilities can be fostered by enabling collaborative, active and reflexive learning among students. Collaborative learning is an essential part of any group-based work and could have a positive influence on student achievement and attitudes, as well as interpersonal skills (Prince, 2004). Active learning can contribute to the engagement of students with a subject or a problem they study (Prince, 2004), while reflexive learning is a way to efficiently combine theory and practice and nurture learning from experience (Dyke, 2009). In this study, we present and analyse our insights of creating spaces and facilitation techniques to promote these three types of learning among students of the "Transdisciplinary Approaches for System Innovations" (TASI) course in KTH during the spring term 2020.

TASI is a project-based course which introduces theories and methods from transition studies and system design, and equip students with modular Participatory backcasting, mPB (Pereverza et al., 2019) as an approach for addressing sustainability transition challenges. The challenge given to students in 2020 was defined in collaboration with societal partners from Järfälla and focused on the development of a more sustainable mobility system in the municipality by the year 2030. The course was taken by 41 students from different disciplinary and cultural backgrounds.

Finished work/ongoing work

To capitalise upon the diversity of the class and create a stimulating learning environment, we developed and introduced a number of facilitation techniques. Collaborative and active learning were supported by (1) Walk around exhibition to explore and input into the work of other groups; (2) Class crowdsourced inspirational ideas for projects; (3) Peer feedback through suggestions, comments, questions, reflections, and discussions of learnings from each other; (4) Students co-create the study activities by providing input and feedback; (5) Different formats and physical layouts for seminars, interim and final presentations; (6) Engagement with different layers of student interactions, class, group, individual. Reflexive learning was facilitated with (1) Short reflection sessions integrated into every second seminar to examine progress and actively extract important learnings and insights; (2) Class responsibility for mutual development during interim and final presentations.

Results/observations/lessons learned

After the course ended, we conducted timeline mapping and reflections mapping (Ho and Pereverza, 2020) for the retrospective analysis of the course design. We also analysed student responses from a course evaluation questionnaire, and the outcomes of project work. The facilitation techniques focused on collaborative, active and reflexive learning proved beneficial for students' learning and performance in the course. Formats we experimented with activated students for a high level of engagement, fostering a creative atmosphere and collaborative learning across the groups. We identified the shift from competitive mindsets with individually owned ideas to one of shared reflexivity and shared outcomes to be prerequisite of efficient collaborative learning. Facilitation techniques also had a positive influence on reflexivity and learning as exploration, which in turn enabled unexpected insights and additional learnings to be synthesised in the final project reports. Active use of physical spaces proved to be an important enabler of active learning, creativity, and different types of interactions and collaborations among students.

Take-home message

Lessons learned from this study can be taken beyond physical spaces of the classrooms. The challenge of designing a digital course in the current pandemic will be how to foster the same mindsets and learning environment that was achieved physically in a digital format. Techniques cannot simply be transferred, but have to be re-designed considering the limitations and possibilities of the digital setting. Without regular physical meetings, it will be harder to build the trust required for techniques such as peer feedback and sharing of insights. However, the digital setting can enable further development of the other techniques as, for example, digital documentation and crowdsourcing ideas in shared documents. Furthermore, it can provide unique possibilities for facilitating digital collaborative, active and reflexive learning (for example, use of online spaces such as Miro, tools for asynchronous work, platforms for task tracking and continuous communication) to be explored.

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Title: The evolution of the industrial engineering courses terminology: an analysis and comparison with the main manufacturing trends

Keywords: Engineering education, terminology trend, Manufacturing, Industry 4.0

Presentation format: Presentation

Stage of the project: Early

Authors:

Antonio Maffei[1] and Eleonora Boffa[1]

[1]ITM, Industrial Engineering And Management

Background and purpose

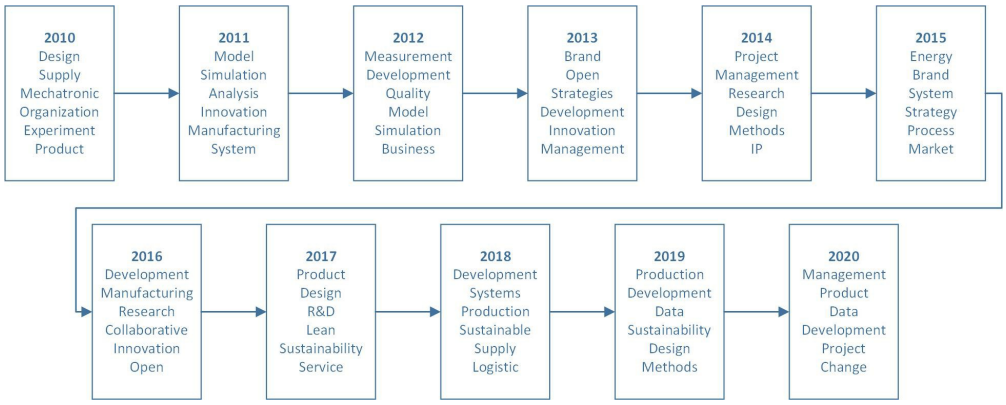
Industry 4.0 (I4.0) is characterised by a significant technological advancement, which has challenged both the manufacturing domain and the engineering education. The critical asset of I4.0 has proven to be represented by the workforce [1]. Therefore, there is a growing concern in academia on how to prepare the new generation of engineers in order to deliver the necessary competences aligned with the basic concepts of the industrial transformation [2].

This paper presents an analysis of the evolution of the terminology used to formulate the Intended learning outcomes (ILOs) of engineering courses at prominent Swedish high education institutions. Furthermore, the resulting trends are analysed in comparison with the main manufacturing streams in order to identify alignment and/or misalignment.

Finished work/ongoing work

The dataset used for the analysis includes information from 105 courses within the field of Industrial engineering and management, focusing on master´s programmes. The exploratory analysis of the records focused on the courses´ ILOs and it was performed for every year over the time span 2010-2020. Due to a large amount of text to be investigated, the authors used a text mining approach. The ILOs represent the main source of text, which was decomposed in single terms and the value of term frequency was calculated. As a result, each year is represented by a list of words with the associated occurrence (Figure 1). For the analysis, the ten most frequent terms were taken into account by the authors to reveal main latent themes. Therefore, it was possible to identify the main clusters which represent the main stream topics taught in the field.

In order to compare the terminology trends with the extant research in manufacturing, the authors refer to the study presented by [3]. The contribution of this work for the present analysis is two-fold. On the one hand, it presents a comprehensive outlook of the manufacturing domain which highlights the main research areas. For the particular scope of this work, the areas used for the comparison are: remanufacturing, sustainable manufacturing (SM), new manufacturing paradigms (NMP) originated from data analytics (e.g. Cyber-Physical systems, Cloud manufacturing, Smart manufacturing), and advanced manufacturing (AdvM) concepts. On the other hand, these manufacturing concepts are presented on a time line (number of publications per year).



Results/observations/lessons learned

Results suggest that the "Product development" cluster has been constantly discussed with a shift towards "Sustainable development" in the recent time. Likewise, the word "Management" appears regularly in the course contents, despite it is associated to different concepts, i.e. brand (2013), project (2014), service (2017) and change (2020). Over the time span, it is possible to recognise few emerging themes, such as "Business models" (2012), "Open innovation" (2013), "Additive manufacturing" (2016) and "Data" (2019).

The specific concept of additive manufacturing in the area of AdvM has seen a steep increase in publications starting from 2010. Yet, the course terminology trends highlight the "Additive manufacturing" theme in 2016. A significant interest in SM started around 2011. In line with the definition of SM given by [3], "Sustainable development" concepts may address this matter which appear in 2017. From 2009, the remanufacturing area has explored several branches of literature among which Business models (BM) for product remanufacturing (e.g. selling service and leasing) and Environmental and economic Analysis (e.g. life cycle assessment and environmental burden). "Sustainable development" may also be considered as part of this area as well as "BM" (2012) and "Service management" (2017). The latter appears to be further related to the NMP, specifically to Cloud manufacturing which interest grew significantly in 2011. Data may be considered as the enabler of all the NMP identified in [3]. However, detected in 2019, "Data" is mostly associated to the context of data mining techniques concerning pattern discovery and predictive methods. Therefore, "Data" can only be partially associated with the NMP.

Take-home message

I4.0 has rapidly evolved the work environment. High education institutions should focus on the current and future educational needs of students. From the results, the authors conclude that an alignment in terms of content between the investigated manufacturing streams and the course terminology trends can be identified. However, there is a time misalignment due to a delay in introducing main streams manufacturing topics in the engineering education.

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Title: Interactive Assignments in Electro Courses at MDA

Keywords: Technology Enhanced Learning (TEL), Möbius Courseware, blended learning, e-learning, Learning Analytics, Community of Inquiry (CoI)

Presentation format: Presentation

Stage of the project: Early

Authors:

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Background and purpose

Abstract

Education at the Mechatronics Division is traditionally based on collaborative-constructivist theory of learning and attempts to integrate theoretical studies with practical exercises (Grimheden, 2006). Most of our courses are characterized by Dewey's catchphrase "learning by doing", developed further in Community of Inquiry (Garrison, 2015) and reviewed by Stenbom (2018). In this digitalized era when technology is changing rapidly, especially electronics and computational technology, it is not far-fetched to expect of our teaching methods to follow this development. Thus, we aim to develop technology enhanced learning in our electro courses in accordance to current pedagogical and technological trends (Ismil, 2020). The main aim of this ongoing research is to examine how teaching presence designed with interactive assignments enhances our students' learning.

Background and Purpose

The first step in this project was to develop intranet rooms in Learning Management System (LMS) Canvas in our electro courses in accordance to the structure of a course and with clear connection to course goals. An important aspect of the intranet room in LMS is the enabling of social interactions through Discussion Forum, where students and teachers can interact with each other (Vaughan, 2013).

Examinations assignments used in previous academic years and carefully sorted in AFS-database by previous teachers are used as teaching material and Möbius Courseware is used as a digitalizing tool.

The great advantage of using Möbius is the possibility to obtain statistically processed data of students' results. This data describe our assignments by measurable information necessary to learning analytics showing us how much our students are developed in solving the examination assignment and even how "hard" some assignment are. Figure 1 shows the statistical data of assignment nr 24000720 used in online examination in course KH1251 January, 7, 2020.

Statistics

Count	Correct	Partial	Incorrect	Success Rate	p-Value	d-Value	p-Biserial	r-Biserial
71	45	9	17	0.687	0.634	0.75	0.83	1.062

Figure 1. Statistics of task 24000720

Finished work/ongoing work

The next step in the development of our courses is the ongoing work on developing interactive assignments with embedded pop-up comments. Developing this function in the mandatory assignments reduced the need for teachers to respond to students' questions in the Discussion Forum. Besides, in our experience, students answer other students' questions in the Discussion Forum, which furthermore decreases the need for teachers to be available.

Results/observations/lessons learned

Efficient education obtained through the use of interactive assignments requires a standardized and an error-free database of the assignments created in accordance to the goals of the course. The road to an error-free database of interactive assignments is long and requires time-consuming work of specialists in both education and programing.
So far, using only a few interactive assignments in each stage of the course KH1251, we have completed our first attempt at this and the results are presented in fig. 2 showing the course grade in KH1251 in the last four course rounds. Interactive assignments have been used mostly in the last course round, and the first online examination, based on the assignments from the same database but without comments in Möbius, was conducted at KTH computer rooms in the presence of exam guards on January 7th, 2020. Although, we are well aware that one course round is not enough for us to draw any valid conclusions, and thus our research continues.

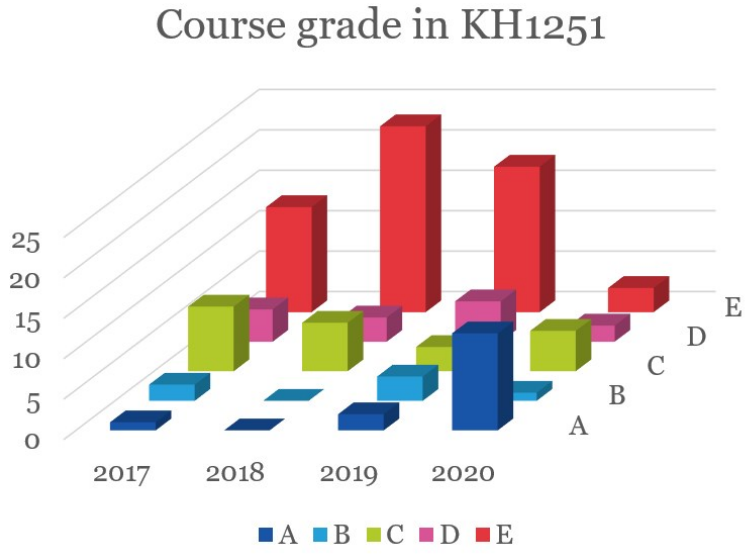

Figure 2. Results until now

Take-home message

References

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Title: Digital literacy – a necessity in digital learning spaces

Keywords: Digital literacy, Global Competence, Course development, Digitally flexible

Presentation format: Presentation

Stage of the project: Mid stage

Authors:

Malin Essén[1], Rosa Lönneborg[1], Mikko Bromark[1] and Göran Hamrin[1]

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Background and purpose

We assume that, in a possible "post-Covid-19"-scenario, the distance-based teaching at KTH will still be a vital influence on KTH-students' learning experiences and future working lives. This assumption is corroborated by the newly implemented KTH policy on digitalisation, which indicates a higher degree of digital learning activities [1].

By digital literacy we mean the general ability to work productively with digital and technical tools, in particular in blended or distance-based learning activities. We here use the framework of JISC [2] to define six different elements of digital capabilities, whose content can be summarized as: Functional skills, critical use, creative production, participation, development, and self-actualizing, see Figure 1. below [2, p.1ff]. Viewing this framework, we conclude that digital literacy is part of the general academic skills that students of today need to possess.

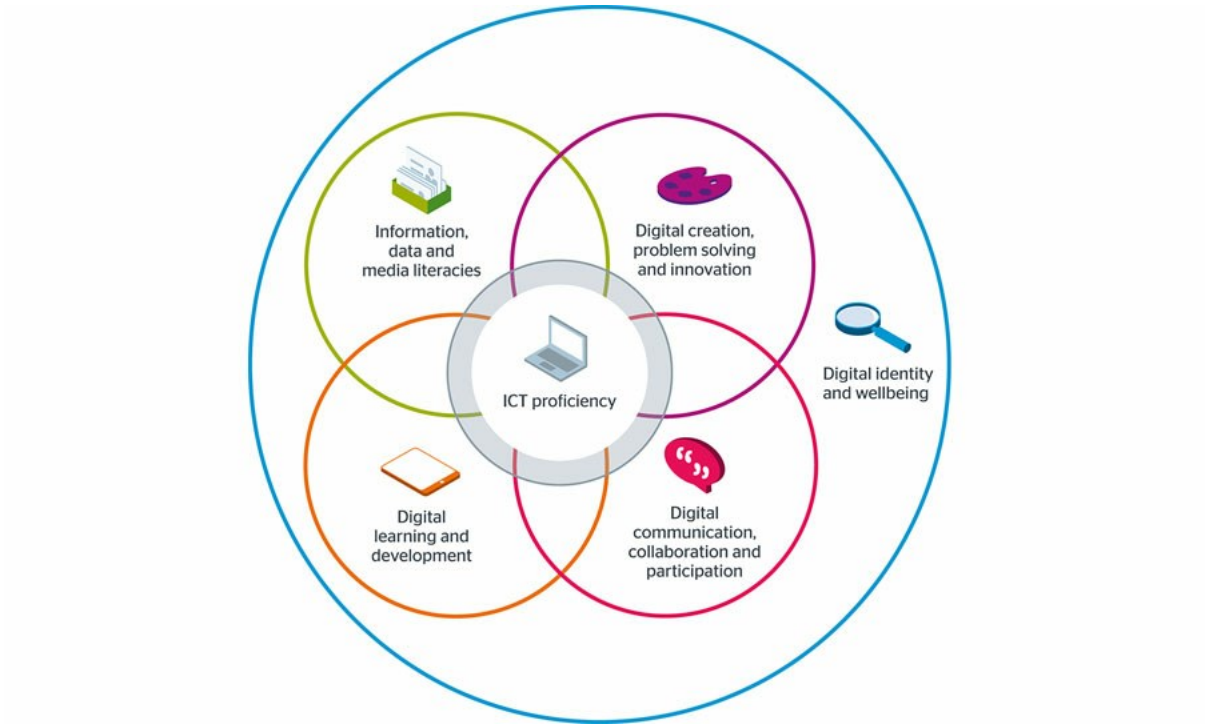

Figure 1. Taken from [2, p. 1].

And as digital literacy is a general academic skill, it is natural to view the library as a promoter of digital literacy. This is in line with the library already being a learning space for different media literacies [3]. A recent example of this is the “data carpentry”-activities produced by the KTH Library with collaborators [4].

Hence, our purpose is to investigate how the KTH Library can be both a virtual arena and a physical learning space for digital literacy.

Finished work/ongoing work

We made a survey in order to see if, and how, digital literacy is strengthened by learning activities at KTH today. In the survey, we frame the questions according to the six JISC-elements. The survey was divided into three parts:

a. A directed survey, with follow-up interviews, to KTH Program Directors as well as key administrators of KTH educational programs.

b. A general survey to students, with emphasis on students in later years of study.

c. A directed survey to PhD-candidates, who have participated in KTH Library learning activities recently.

From the results of the survey in c. above, we have developed a few workshops on digital literacy, in particular on different aspects of research data management. The ideas for them also come from needs and requests made by students and teachers

in earlier contacts with the KTH Library staff and learning activities. Subjects of these workshops are reflecting the six elements of the JISC-framework.

Results/observations/lessons learned

The preliminary results of our survey indicate that aspects of digital literacy are covered to some extent by learning activities today, but that the coverage is far from complete at KTH. In our future work, we will explore additional results from the survey.

Take-home message

We have mapped how digital literacy is facilitated at KTH today via a survey. We have developed a series of workshops on different aspects of digital literacy for an academic environment. And through our survey and these workshops, we have gained additional insights on how a library can be a natural learning space for fostering digital academic skills. We will in our talk highlight some of the achievements, and also briefly discuss some of the challenges for the future.

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Title: Workshop: Digital undervisning och pedagogik värd att sprida

Keywords: Digital lärmiljö, Kursutveckling, ,

Presentation format: Workshop

Stage of the project: Mid stage

Authors:

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Background and purpose

Under covid-19-pandemin har KTH:s lärare på kort tid och i regel utan extra resurser gått från traditionell salsundervisning till digital undervisning. Övergången har skett genom ett stort innovativt och kompetensutvecklande arbete, vars pedagogiska insikter och erfarenheter är värda att ta tillvara på. Vi har på ett systematiskt sätt samlat in studenters och lärares erfarenheter av vad detta utvecklingsarbete har lett fram till, med fokus på vad som upplevts som givande men också med några exempel på misstag och mindre lyckade idéer, i syfte att vidareutveckla och sprida de praktiska lärdomarna.

Finished work/ongoing work

Under höstterminen 2020 distribuerades två enkäter, en riktad till studenter och en riktad till lärare. Varje respondent gavs möjlighet att beskriva upp till tre goda exempel i detalj och i samband med detta ange:

- kurskod och kursnamn
- vilken typ av aktivitet det handlade om
- hur det goda exemplet såg ut och genomfördes
- vad var det som gjorde detta till ett gott exempel
- hur skulle det goda exemplet ytterligare kunna förbättras.

Vi har också besökt seminarier på olika avdelningar, intervjuat några lärare och studenter, mm. Med vårt arbete hoppas vi att kunna identifiera aktiviteter som ansetts givande av studenter och lärare.

Results/observations/lessons learned

I början av workshopen presenterar vi kortfattat resultaten. Fokus ligger därefter på deltagarnas egen undervisning och hur den skulle kunna vidareutvecklas med utgångspunkt från de sammanställda resultaten. Under workshopen kommer deltagarna att dels ges tillfälle att diskutera hur de vunna erfarenheterna skulle kunna implementeras i deras egen undervisning och dels ges tillfälle att diskutera vad som behöver förbättras och vidareutvecklas ytterligare för att erfarenheterna ska kunna passa KTH:s framtida behov.

Take-home message

Det finns en mängd nya innovativa insikter, knep och erfarenheter kring digitala undervisningsmetoder värda att spridas på KTH. Den här workshopen ger dig möjlighet att ta del av några av dem och att arbeta med att anpassa dem till din egen undervisning.

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Jeffery, Kathleen A., and Christopher F. Bauer. "Students' responses to emergency remote online teaching reveal critical factors for all teaching." Journal of Chemical Education 97.9 (2020): 2472-2485.

Title: Active reflective learning by wiki - Experiences from first year to doctoral level at KTH

Keywords: Active learning, Digital learning, Peer learning,

Presentation format: Presentation

Stage of the project: Mid stage

Authors:

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Background and purpose

A novel learning activity, in which students create exercise problems and solutions (of another student) on wiki pages, has been implemented in a number of courses in numerical analysis for the past years. The aim of the wiki activity is to stimulate students to interact with the material in a deeper way, more characterized by creativity and playfulness than when solving given problems on their own. The courses also contain lectures, homework, videos and quizzes, and the wiki activity is not intended to replace any of these. It provides additional student-teacher (and student-student) interaction within the subject. The technique has been used in courses ranging from bachelor level, to master and PhD level.

Finished work/ongoing work

In the first-year course, *SF1547 Numerical Analysis*, with about 250 students, each section of the class (with about 60 students) has its own wiki page. Experiences show that when it works well students answer each others' problems and help each other. Exposing their work to classmates and teachers seems to motivate students. The questions and solutions posted by students are coupled to the topic of the week. They are moderated, and each post is checked by teachers or teaching assistants. If necessary, a dialogue is initiated so the student can make corrections. Towards the end of the course, a selected set of questions are marked as appropriate for exam preparation and distributed in a separate PDF-file. As it is implemented in this course, the wiki activity works as a stimulus for the stronger students. Contributing to the wiki is voluntary and gives bonus points that can only be used for reaching one of the higher grades (A or B), never for reaching the passing grade (E). About half of the students attempt producing wiki questions. The others spend their time on other activities, e.g. the homework and quizzes, and they can still benefit from using the selected questions as exam preparation.

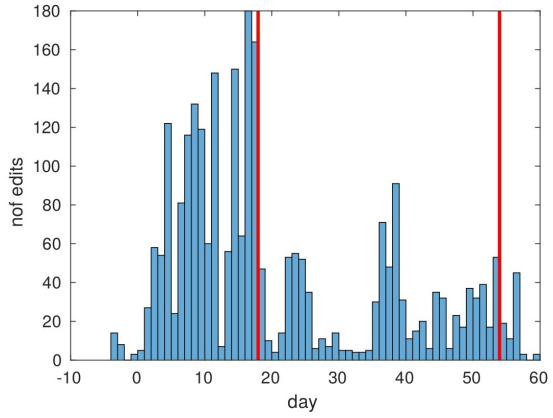
The master-level course *SF2524 Matrix computations for large-scale systems* and the PhD level course *SF3580 Numerical linear algebra* are taught partially jointly with a common wiki. Approximately 30 students attend, including doctoral level students who are required to do additional work on the wiki. In particular the PhD students have been very enthusiastic producers in the wiki activity, e.g., since it allows the freedom for them to relate the contents of the course to their research area. This seems to have considerable value also for master students. The student-student interaction between master and

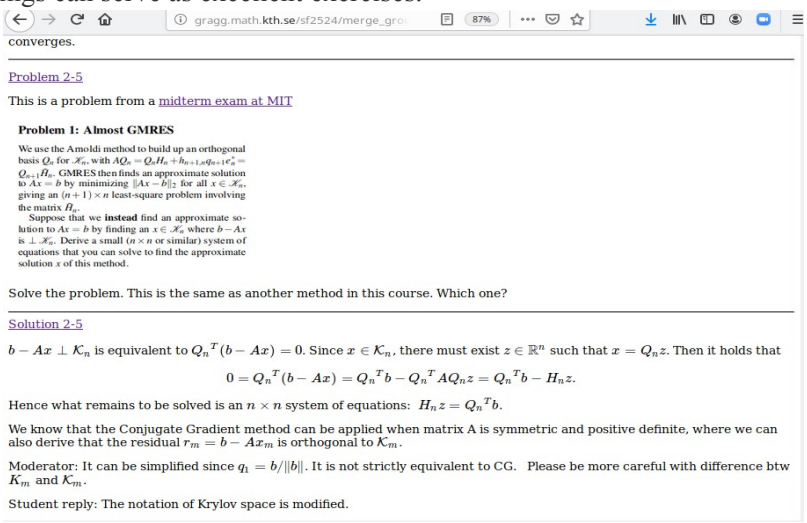
PhD level students makes the master students see that the gap between research and education is not insurmountable. The same setup has also been used in the master course *SF2526 Numerics for data science* and the PhD level course *SF3584 Preconditioning for linear systems*.

Technically, we use our own server with small scripts (written in PHP) which provide an interface to CANVAS (via the REST API) where all the edits are made and stored.

Results/observations/lessons learned

Our observations indicate a positive effect on the learning, as indicated by comparison between different courses that do not use this technique. The students tend to spend time on this task continuously throughout the course; see figure. According to the course analysis, the technique has increased genuine interest in the material. Another positive factor is that the activity provides a natural way to incorporate material from other universities (see figure with problem from MIT) making the result feel more relevant and meaningful, and even increase self-confidence. Videos produced by others and wikipedia entries are naturally connected to the course as errors / shortcomings can serve as excellent exercises.




converges.

Problem 2-5

This is a problem from a midterm exam at MIT

Problem 1: Almost GMRES

We use the Arnoldi method to build up an orthogonal basis Q_n for $\mathcal{K}_n$, with $AQ_n = Q_n H_n + h_{n+1,n} q_{n+1} e_n^* = Q_{n+1} \tilde{H}_n$. GMRES then finds an approximate solution to $Ax = b$ by minimizing $\|Ax - b\|_2$ for all $x \in \mathcal{K}_n$, giving an $(n+1) \times n$ least-square problem involving the matrix $\tilde{H}_n$.

Suppose that we **instead** find an approximate solution to $Ax = b$ by finding an $x \in \mathcal{K}_n$ where $b - Ax$ is $\perp \mathcal{K}_n$. Derive a small ($n \times n$ or similar) system of equations that you can solve to find the approximate solution x of this method.

Solve the problem. This is the same as another method in this course. Which one?

Solution 2-5

$b - Ax \perp \mathcal{K}_n$ is equivalent to ${Q_n}^T(b - Ax) = 0$. Since $x \in \mathcal{K}_n$, there must exist $z \in \mathbb{R}^n$ such that $x = Q_n z$. Then it holds that

$$0 = {Q_n}^T(b - Ax) = {Q_n}^T b - {Q_n}^T A Q_n z = {Q_n}^T b - H_n z.$$

Hence what remains to be solved is an $n \times n$ system of equations: $H_n z = {Q_n}^T b$.

We know that the Conjugate Gradient method can be applied when matrix A is symmetric and positive definite, where we can also derive that the residual $r_m = b - Ax_m$ is orthogonal to $\mathcal{K}_m$.

Moderator: It can be simplified since $q_1 = b/\|b\|$. It is not strictly equivalent to CG. Please be more careful with difference btw K_m and $\mathcal{K}_m$.

Student reply: The notation of Krylov space is modified.

Take-home message

From a course development perspective, the wiki exercise has, as a side-effect, provided deeper insight into the student learning process. The additional viewpoints provided by the students have helped us make improvements in the course in general. The development of course material has accelerated. Most notably, the exam questions now have a higher variation (less "typtal" character) and provide a better examination of the course aims. The teacher and teaching assistants now have a repertoire of more and better explanations of certain concepts thanks to the wealth of ideas provided by students in wiki problems.

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Title: Teaching and learning practical activities in Sound and Vibration courses during the COVID-19 pandemic

Keywords: Blended learning, Distance laboratories, Project-based learning, Student engagement and motivation

Presentation format: Workshop

Stage of the project: Mid stage

Authors:

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Background and purpose

In this workshop we will share our teaching and learning experiences in the Sound and Vibration track at KTH, with emphasis on the challenges we are facing with practical activities in pandemic times while ensuring the quality of education remains unaffected. These are tangible challenges faced currently by higher education institutions worldwide, where distance laboratories are susceptible to exclude hands-on experience and compromise learning outcomes [1]. Questionnaires will be distributed to teachers and students of the track in order to gather reflections based on the learning experience and compare them with results from related pedagogical studies. The results from these questionnaires will be shared in the introduction of the workshop. The activities in the remainder of the workshop will entail interactive open discussions across participants. These will include small group discussions, using active learning strategies jigsaw / think-pair-share to combine different perspectives and form a holistic picture [2].

Finished work/ongoing work

The focus of the discussion in the workshop will be laboratory activities, which is a unique element in most of the BSc/MSc courses offered in the Sound and Vibration track. A few courses including proportion of laboratory work: SD1120 Noise and Vibration Control (2/9 ECTS), SD2150 Experimental Structure Dynamics (6/9 ECTS), SD2125 Signals and Mechanical Systems (1/6 ECTS), and SD2155 Fluid Acoustics (2/6 ECTS). For instance, the students' project in SD1120 amounts to designing and constructing a silencer that can attenuate tonal noise, whose learning outcomes are aligned with the educational framework for engineers CDIO [3]. This year the students had to execute the practical activities by using numerical simulations and experimental data from previous years. An answer we hope to shed light on is how the lack of hands-on experience in the construction part of the project affects the practical learning outcomes of the course. Another interesting case was the laboratory exercise in SD2150, held earlier this year, in which students gave remote instructions to the teacher who was in the lab: e.g., where to place the sensors and how to perform the measurements. We are about to do the laboratory exercise in SD2125—comprising the active control of noise with digital signal processing—where students will spend more time in preparations than in previous years in order to keep the laboratory time at a minimum. SD2155 will be offered next spring, and the experiences gathered so far will be very valuable to make suitable preparations and adjustments for the laboratory exercises.

Results/observations/lessons learned

Despite research suggesting that physical and virtual laboratories could achieve similar learning objectives [4], we argue that shifting our course's hands-on activities completely to the digital realm may cause a great loss in the quality of education [1,5], since the intended learning outcomes associated with practical activities would be compromised. At this point we recognize the potential for using blended laboratories to design preparatory virtual sessions prior to the actual laboratory, allowing students to go at their own rhythm [6]. Nevertheless, great care must be taken into engaging and motivating the students, as the interactions between them and with the teachers might become acutely limited [5]. Overall, our experiences so far point out considerable risk of distance laboratories preventing human-human and human-machine interactions so vital to the integral formation of the students who follow the Sound and Vibration track.

Take-home message

A number of pedagogical challenges are pertinent for us right now and the months to come. What can be considered a practical learning activity as a learning outcome? How can we ensure hands-on experience is not lost? How much should we invest now in transitioning practical activities into virtual spaces in the future? How can we promote the engagement and interaction of students in such practical activities? We hope this workshop serves as a means to enlighten possible answers to these questions.

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Title: Value sensitive design: ett (digitalt?) verktyg för den etiskt medvetna ingenjören

Keywords: Value sensitive design, Etik, Ingenjörsetik ,

Presentation format: Workshop

Stage of the project: Mid stage

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Background and purpose

I denna workshop illustrerar vi en metod som väver in etiska frågeställningar i produktutvecklingsprocessen, nämligen *Value sensitive design* (VSD). Genom metoden undviker man att enbart diskutera etiska dilemman i efterhand där den etiska analysen blir ett sorts efterspel. Istället uppmanas studenterna att diskutera etiska frågeställningar tidigt och kontinuerligt under en utvecklingsprocess. Vi riktar oss till programansvariga och lärare på ingenjörsprogram och ämnar synliggöra ytterligare ett sätt att integrera etik i reguljära ingenjörskurser.

Value sensitive design är en metod för att systematiskt arbeta med frågor rörande etik vid utvecklingen av ny teknik. Metoden utvecklades av Batya Friedman och kollegor vid University of Washington (Friedman et al. 2013) och har under de senaste två decennierna diskuterats kritiskt och vidareutvecklats (Manders-Huits 2010; van de Poel 2013; Davis & Nathan 2015; Spiekermann 2018). Syftet med metoden är att integrera etiska frågeställningar i designprocessen och därigenom främja teknikens positiva inverkan på samhällen och människor. Detta görs bland annat genom att identifiera intressenter och relevanta värden för att sedan arbeta med dessa på ett iterativt sätt (Friedman & Hendry 2019).

Finished work/ongoing work

Results/observations/lessons learned

Workshoppens upplägg

Efter en kort introduktion av VSD som koncept ämnar vi att ägna huvuddelen av workshoppen åt att låta deltagarna tillämpa metoden genom att använda så kallade ”envisioning cards” (https://vsdesign.org/). Deltagarna delas in i mindre grupper där de ges ett exempel på teknik att diskutera och ett urval av kort som deras diskussion bör utgå från. Korten tar upp olika frågeställningar under kategorierna intressenter, tid, värden och genomslagskraft. Gruppmedlemmarna tar ett kort i taget och läser frågan, tänker efter själva och diskuterar sedan tillsammans. När de känner att de har täckt alla relevanta aspekter av frågan tar de nästa kort. Workshoppen avslutas med en diskussion i helgrupp där vi sammanfattar och diskuterar fördelar/nackdelar/utmaningar vid implementation av VSD i faktisk undervisning, i synnerhet hur man lämpligen anpassar upplägget till digital undervisning. För att underlätta detta ämnar vi dela ut post-its till deltagarna där de kan skriva sina

reflektioner under workshoppens gång.

Take-home message

Genom att analysera och hitta lösningar på nuvarande och framtida problem spelar ingenjörer en avgörande roll i samhällsutvecklingen. Därför är det viktigt att blivande ingenjörer får möjlighet att utveckla en medvetenhet och reflektera kring de många utmaningar de kan komma att ställas inför. Ett av målen enligt Högskoleförordningen att kunna ”göra bedömningar med hänsyn till […] etiska aspekter” (SFS 1993:100). Det finns ett flertal vedertagna sätt och metoder att undervisa ingenjörer i etik, till exempel klassiska föreläsningar i moralteori med efterföljande seminarier eller casebaserad undervisning grundad på etiska riktlinjer för ingenjörer. Ofta läggs etikundervisningen som ett fristående moment i en större kurs, till exempel en programsammanhållande kurs eller en kurs i ingenjörsfärdigheter. Etikmomentet är då frikopplat från teknikämnena trots att undervisningen är mer relevant och engagerande om den ligger nära utbildningen i övrigt och integreras i teknikkurserna (Jonassen et al 2009). VSD är metod som med enkla medel kan tillämpas i kurser där studenterna arbetar med eller diskuterar produktutveckling och fungerar då som ett uppskattat komplement till övriga inslag av etik i ingenjörsutbildningen.

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Title: Experiences and lessons learned by offering introductory training for teaching assistants who teach computer science

Keywords: Teaching assistants, TAs, TA training,

Presentation format: Presentation

Stage of the project: Mid stage

Authors:

Emma Riese[1], Susanna Jidell[1], Linda Kann[1] and Viggo Kann[1]

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Background and purpose

Teaching assistants (TAs), students that are employed to assist the faculty, play an important role in many courses, by for instance conducting tutorials, helping and guiding students, and assessing assignments [1]. Especially in the courses that are given to a large number of students, TAs are widely used as a way to enable one-to-one tutoring and individual feedback [2]. However, previous studies have shown that TAs are not always offered sufficient training [3]. In 2019, the EECS school decided to initiate a mandatory training course for all computer science TAs [4], and this is a brief report on the experiences of this initiative. The purpose of this initiative has been to make our TAs more comfortable and prepared in their TA role. This includes multiple aspects, for instance, to empower the TAs to ask for well-defined lab grading criteria, if that is missing.

Finished work/ongoing work

The first offering of the TA training course was given in January 2020. The course consists of five modules (expected time for each module in parentheses):

1. HR questions (30 min)
2. Classroom teaching (60 min)
3. Helping students and supervising lab sessions (60 min)
4. Workshop regarding assessment (120 min)
5. Discussion and reflection seminar about modules 1-3 (90 min)

Modules 1-3 are online modules in Canvas [5], each containing several quizzes. Modules 4-5 are scheduled sessions that first took place on campus but since March 2020 have been conducted through Zoom. During the spring semester, the course was given in Swedish. In the summer of 2020, the course material was translated to English, and modules 4 and 5 are since then offered in both English and Swedish. The TAs are paid the same hourly salary for taking part in the TA training as they earn for teaching. TAs that are employed as amanuensis (sv. amanuens) are also required to enroll in the course and for them it counts as part of their competency development. All TAs that have participated in the TA training course have been given

the opportunity to anonymously fill out a customized course evaluation, and informed consent to use the answers for research purposes has also been collected.

Results/observations/lessons learned

Most of the TAs enrolled in the training course have given it positive reviews. A commonly mentioned strength of the course has been the interactive sessions, meeting and discussing with other TAs. Many TAs have also experienced the course as valuable for their TA development. For example, a TA wrote:

"Great initiative, the course gives you tools that will make your role as a TA easier, and some grounds to develop within!"

As instructors in the course, we have also learned from the processes and continued to improve and develop the course throughout the year, based on the feedback from the TAs. During the conference, we will be able to share more examples from the course content as well as results from the course evaluations.

Take-home message

To offer an introductory TA training course has been a great experience for us involved in the course and, in general, resulted in positive evaluations from the TAs who participated in the training. A portion of what we teach is specific to computer science, while other elements of the training are more general and focus on pedagogical aspects and the TA role. We hope this initiative of TA training can spread across KTH and are more than happy to share our course material and experiences.

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Title: Computer Science students' perceptions of emergency remote teaching caused by the COVID-19 pandemic

Keywords: students' perceptions, emergency remote teaching, computer science majors,

Presentation format: Presentation

Stage of the project: Finished

Authors:

Emma Riese[1] and Viggo Kann[1]

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Background and purpose

When the COVID-19 pandemic broke out, universities all over the world had to close down their campuses and move all education online in just a matter of days [1]. At KTH, where a vast majority of the education typically takes place on campus, this caused a very rapid change. In this study, we wanted to evaluate how the students had experienced their education and surveyed students enrolled in year 1-3 of the 5 year computer science and engineering programme, and in both years of the master of science programme in computer science.

Finished work/ongoing work

The surveys were distributed in May 2020, as part of a mandatory assignment in the program integrating courses in the respective programmes [2]. It was mandatory for the students to fill out the survey, but the students were not graded on their responses. We got responses from almost all active students, altogether 794 respondents (139, 173, 148, 166, 168, for each grade respectively). We asked the students to compare the typical campus education before the pandemic, with the spring semester's digital education, on a number of aspects, such as stress, procrastination, motivation, and their experienced possibility to fulfill the learning outcomes. We also specifically asked the students to compare the quality of different course activities, such as lectures, tutorials, and computer labs. All of these questions were asked on a 7-point Likert scale ranging from *1 = Distance education is considerably better*, to *7 = Campus education is considerably better*, and with 4 being a neutral value. In addition, we also asked the students to name the main advantages and disadvantages of this new education format, in two open-ended questions.

Results/observations/lessons learned

In general, the results show that the majority of the students preferred the on-campus setting in all aspects and regarding all course activities. This was shown to be statistically significant as one-sample Wilcoxon signed ranked tests, testing the null hypnosis that the median =4 (that is that distance education and on-campus were experienced as equivalent), all had p-values < 0.05, favoring the on-campus setting. The students were slightly more positive about the online lectures, and many students stated, in the open question, that having recorded lectures makes it easy to pause and rewatch if needed. The

students also appreciated the flexibility that comes with remote teaching and that their commuting time disappeared. There were also a couple of differences between different grades, where for instance first-year Master students were more positive about online lectures compared to 2nd and 3rd-year bachelor students. The main disadvantages that students mentioned were lack of motivation, study discipline, and lack of social interactions with other students as well as teachers.

During the conference, a more detailed presentation of the collected data will be given. It is, however, also important to remember that the results show the students' perceptions of online education given during the first months of the pandemic. It does not imply that distance education, in general, is experienced as less sufficient, it rather shows that last-minute changes from a familiar on-campus setting to a remote one are very challenging. When evaluating the results during the pandemic it is important to note that distance education is not the same as emergency online education [3].

Take-home message

Remote emergency teaching is challenging, and this is well reflected in the students' perception of their education during the spring semester of 2020. We should, however, learn from the experience and for instance, recorded lectures seem to be something the students would appreciate also in a post-covid-19 world.

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Title: Scholarship of third-cycle education at KTH: How could doctoral education move forward?

Keywords: third-cycle education, doctoral students, ,

Presentation format: Workshop

Stage of the project: Mid stage

Authors:

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Background and purpose

Third-cycle education is an important part of higher education at KTH, but has been limited discussed during previous KTH SoTL conferences. Third-cycle education can, however, face a different set of challenges compared to first and second-cycle, and there have for instance been alarming reports concerning the well-being of doctoral students [1]. The COVID-19 pandemic, has also come with an additional set of challenges for doctoral students [2], and balancing the different roles within a doctoral education program has been reported as difficult [3].

The purpose of this workshop is to highlight, reflect on, discuss and find possible solutions to some of the key issues which were identified in the doctoral student survey, that was conducted by the PhD Chapter at KTH in December 2019 [4]. The workshop will be structured around the questions:

• How should third-cycle education at KTH look like in ten years, 2031?

• What do we need to change to reach that vision?

Finished work/ongoing work

In December 2019, the PhD Chapter (THS) sent out a survey to all doctoral students that had a registered study activity and email address in Ladok [4]. KTH has also recently sent out a survey to all doctoral students that were admitted to their doctoral studies between the years 2012-2016 [5]. In addition, in UKÄ's recent review of KTH's quality assurance system, they highlighted that the doctoral students at KTH were not given as good opportunities to influence their education as first- and second-cycle students, but at the same time recognizing that this is something KTH works with [6]. A short summary of the survey results from the PhD Chapter's report on "Consequences of COVID-19" gave some insights into how the current pandemic influenced KTH's doctoral students at the beginning of the pandemic [7].

Results/observations/lessons learned

Third-cycle education differentiates from first- and second-cycle, and comes with a set of own challenges. Based on the four

sources regarding KTH's doctoral students [4-7], we like to focus on some key topics that have been identified to have room for improvements:

• **Supervision** [4-5] - what characterizes good supervision and how do we achieve that?

• **Doctoral student influence and evaluations of study programs** [4, 6] - how can this be strengthened and unified across KTH?

• **Well-being and balance between private and working life** [4] - what can be done to support the doctoral students to achieve this? For instance, how can the work culture support a good balance?

• **Study and work environment** [4] - what is working well and what can be improved?

• **Career opportunities and guidance for doctoral students** [4-6] - what can be done to strengthen this?

• **COVID-19 pandemic consequences** [7] - what can we learn from this experience and how can we minimize potential damage to doctoral education on short and long term?

Take-home message

Third-cycle education at KTH can, and should, be improved. If you are ready to share your ideas and visions for how, please attend our workshop.

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Title: Utvärdering av den akuta övergången till digital utbildning på KTH pga. Covid-19

Keywords: digitalt lärande, akut fjärrundervisning, utvärdering,

Presentation format: Presentation

Stage of the project: Finished

Authors:

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Background and purpose

När Covid-19 drog över världen vid årsskiftet 2019/2020 påverkades all utbildning. Uppskattningsvis har mer än 1,5 miljarder studenter och ungdomar i världen drabbats av nedstängda av skolor och universitet på grund av Covid-19 (UNESCO, 2020). Så även KTH som efter regeringens rekommendationer från den 18 mars 2020 över en natt övergick till distansundervisning för vårterminen.

Syftet med denna utvärdering är att klarlägga KTH:s lärares och studenters uppfattning av den akuta fasen av den påtvingade digitala omställningen

De principer som KTH och större delen av utbildningssektorn globalt tillämpade kallas akut fjärrundervisning (eng. emergency remote teaching) och består av att med kort framförhållning övergå till att bedriva undervisning på distans (Bozkurt & Sharma, 2020; Hodges et al., 2020). Akut fjärrundervisning karaktäriseras av att de undervisnings- och examinationsaktiviteter som normalt genomförs på campus ersätts med digitala motsvarigheter men utan någon funktionell förändring. Detta i kontrast till digital utbildning som utvecklats och beforskats under många decennier med teoretiska ramverk, modeller och standarder för att genomföra högre utbildning som antingen helt eller delvis medieras med digitala verktyg (Bates, 2019; Garrison 2017; Moore, 2013).

Finished work/ongoing work

Utvärderingen av KTH:s digitala omställning under vårterminen 2020 genomfördes med två enkätstudier, en för lärare och en för studenter. Dessa utformades med kvantitativa påståenden och kvalitativa frågor kring uppfattningar om den digitala omställningen för enskilda kurser och på en generell KTH-nivå. Enkäten producerades i både svensk och engelsk version och data samlades in mellan 9-29 juni 2020. Enkäterna skickades till lärarna (examinator, kursansvarig, lärare eller lärarassistent) och deltagarna (kursregistrerade studenter) för alla kurser under läsperiod 3 och 4. Totalt fick lärarenkäten 384 svar (25.8%) och studentenkäten 1796 svar (11.5%).

Results/observations/lessons learned

Analysen genomfördes i två delar, en för kvantitativa data och en för kvalitativa data. För de kvantitativa data gjordes statistiska tester för att klarlägga beroenden samt att deskriptiv statistik kring både förändringen och hur den uppfattats togs fram. De kvalitativa resultaten involverade alla fritextsvar och analyserades genom tematisk analys (Braun & Clarke, 2006).

Resultatet indikerar att lärare och studenter tycker att KTH lyckats relativt väl med den akuta övergången till helt digital utbildning. En väsentlig del av den undervisning som i vanliga fall ges på campus genomfördes genom webbmöten följt av skriftligt material och förinspelade videos. Undervisningsmoment som normalt kräver särskild utrustning eller lokaler (t.ex. laborationer) kunde i viss utsträckning genomföras genom surrogat i form av t.ex. videomaterial. Det förekom även att studenter fick hem laborationsutrustning. Flödesanalysen för examination visar en stor uppgång för muntlig examination via webbmöte, hemtentamen och skriftlig digital examination med kameraövervakning (via zoom). Den skriftliga digitala examinationen med kameraövervakning uppfattas som problematisk av flera lärare och studenter. Bland utmaningarna nämns osäkerheter kring att man inte tar tillvara på teknikens möjligheter samt att kameraövervakad examination upplevs integritetskränkande, mindre rättssäker än den kontrollerade miljön i fysisk sal samt skapar oro och stress hos studenter och personal.

Både lärare och studenter uppger att de saknar de sociala spontana interaktionerna som fysisk utbildning kan ge upphov till. Vidare uppger lärarkåren tydligt att de fått ta ett betydligt större ansvar för de administrativa sysslorna som de får stöd med i den fysiska utbildningsmiljön. Utvärderingen visar även tydligt att lärare och studenter vill att KTH fortsätter satsa på att utveckla användandet av digital utbildning efter Covid-19 pandemin.

Take-home message

Lärare och studenter tycker att KTH lyckats relativt väl med den akuta övergången till helt digital utbildning.

Man har i stor utsträckning ersatt salsundervisning med undervisning på Zoom.

För examination ses en markant uppgång för muntlig examination.

Lösningen med skriftlig digital examination med kameraövervakning uppfattas som problematisk.

Lärare och studenter vill att den digitala utvecklingen av utbildningen fortsätter efter Covid-19.

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Title: When flying blind, bring a co-pilot

Keywords: Remote Teaching, Zoom Lecture, Peer Observation of Teaching, Learning Spaces

Presentation format: Presentation

Stage of the project: Finished

Authors:

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Background and purpose

The skill set surrounding remote teaching is one that many of us are building. Besides the new technological challenges, we also encounter challenges in our experience of teaching; no longer can we read the room, rather we can only gaze out into a grid of mostly black squares that Zoom presents to us. Efforts to "read the Zoom", such as asking students to turn camera on might work in small classes, but for classes of more than 30 students, this becomes unfeasible.

The purpose of this contribution is to share our positive experiences of remote teaching, with a focus on strategies to improve remote lectures (and lectures in general). We experimented with a co-pilot approach to remote lectures, where one academic takes the lead for presenting the lecture, whilst the second academic, the co-pilot, takes care of various duties like managing chat, keeping time, reminders, confirmations, and engaging in discussion throughout the lecture. The end result was a more enjoyable experience for the students and a less lonely experience for the academic, and a natural way to introduce aspects of peer observation of teaching [1].

Finished work/ongoing work

We have used co-pilots in the following courses:

(C1) DD1301 Computer introduction, a two-week course with 265 first year students from mixed programmes. It consisted of three one-hour lectures given jointly by the authors.

(C2) DD1337 Programming, a 10-week course with 200 first-year (CDATE) students. It consisted of 13 two-hour lectures given jointly by the authors.

(C3) DD1315 Programming Techniques and Matlab, a 10-week course with 163 first year CINEK students. It consisted of 16 two-hour lectures, given one author and a teaching assistant.

C1 was our initial experiment. Students generated quite some traffic in the chat, e.g., 344 messages during a one-hour lecture. After this experience we realized that it would be difficult to be only one person managing the chat while giving the lecture.

C2 was also given by the authors. Each weekly lecture has given us the opportunity to experiment with the co-piloting approach and learn where it is helpful.

C3 explored the potential of using a teaching assistant instead of another academic.

Results/observations/lessons learned

Benefits for students:

* Better energy in discussions between teacher and co-pilot, allowing multiple perspectives, and informal chat throughout the lecture.

* Students can ask questions in chat and have them answered directly by the co-pilot, or the co-pilot can decide to interrupt and share the question with the teacher.

Quotes from students:

"*The lectures have been very good! Super good that Daniel can keep track of the chat while Ric continues with the lecture, in this way there will be good flow in the lecture at the same time as questions are answered.*"

"*Being several who give the lectures is absolutely fantastic! And when there is some part that is "boring" as a plus [a student who already knows the topic], there is almost always something interesting in discussing with the chat about.*"

"*I think the lectures have been rewarding. Zoom lectures become what you make of it, and Ric & Daniel have been great and created a real cozy atmosphere!*"

Benefits for teachers and co-pilots:

* You are not alone. Simple audiovisual checks can be made. Reminders on timekeeping. Alerts to important discussions from the chat area. Co-pilot can ask questions pre-emptively, based on their experience. Immediate feedback on teaching.

* There is no technical cost. Adding another teacher is easy and feels natural.

* You can focus. Stress of managing remote teaching aspect can make us underperform. Offloading this helps refocus on learning.

Benefits for the co-pilots:

* Co-pilot sees another way of teaching a topic and sparks reflection on someone else's teaching and their own. In the case of the teaching assistant, they also gained some new insights into the topic, despite being experienced.

Whilst not the intention, co-piloting became a way of introducing some concepts of peer observation of teaching (POT)[1], a critical pedagogical practice for helping to develop and maintain awareness of how you perform in class from someone else's point of view. Traditionally, the peer serves passively as the "observer". In the online setting, the peer can actively participate and there will still be a digital record of observations to analyse afterwards.

Frictionless setup was also a benefit. The teacher and the co-pilot do not have to be physically in the same space. With time constrained teachers, cutting on "commuting time" across campus decreases the friction and lowers the bar for adoption.

Perhaps the largest downside of this approach is the time cost of having two teachers per lecture. However, we found that a teaching assistant could fulfil this role.

Take-home message

Remote teaching is new for many. One of the simplest ways to recover your sense of what is going on in your class and to improve the experience for all is to *invite a co-pilot to your lectures*.

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Title: Escape från det slutna magasinet – en gamifierad biblioteksintroduktion

Keywords: Grupparbete på distans , Digitalt-flexibel , Studentengagemang och motivation , Studentens lärande

Presentation format: Presentation

Stage of the project: Finished

Authors:

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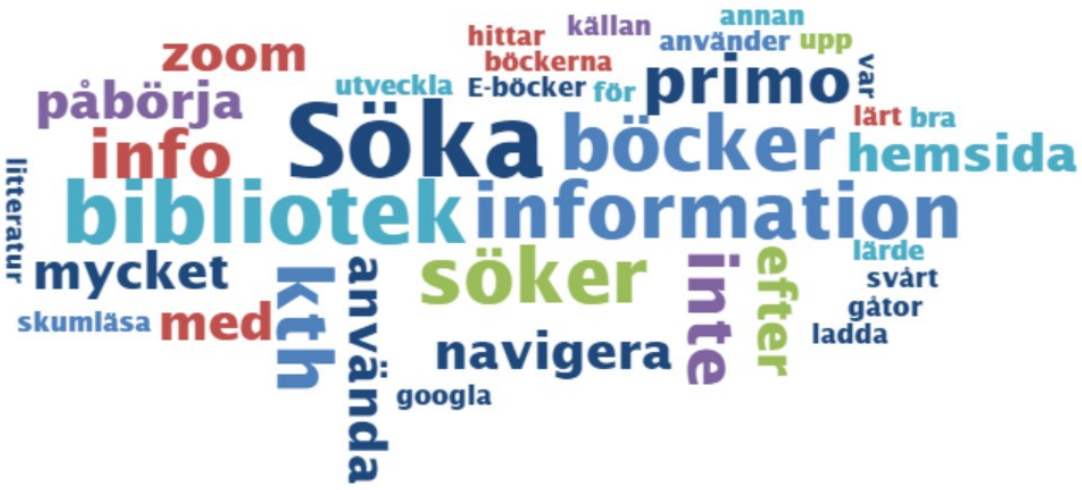
Background and purpose



Hösten 2018 höll Raymond Pun, forskningsbibliotekarie vid i Alder Graduate School of Education, USA, en workshop på KTH Biblioteket om hur en Escape room-aktivitet kan främja undervisning i informationskompetens. Ett Escape room går ut

på att i grupp lösa olika gåtor för att ta sig ut ur ett låst utrymme inom en viss tid. Vi fick exempel på hur bibliotek kan använda metodiken för att på ett kreativt sätt engagera studenterna i undervisningen. Det här blev starten för KTH Bibliotekets utveckling av Escape room som undervisningsform.

Hösten 2019 höll biblioteket en introduktion för nya studenter i form av ett fysiskt Escape room. Studenterna uppskattade tävlingsmomentet, att vara aktiva och samarbeta i grupp men det var svårt att genomföra på KTH:s alla campus, och riggandet tog mycket tid. Lösningen blev ett digitalt Escape room i blended learning-form. I och med covid19-pandemin har aktiviteten också genomförts helt digitalt.

Finished work/ongoing work

Ramberättelsen för vårt digitala Escape room var att gruppen deltog i en visning av bibliotekets äldre samlingar och blev inlåsta i magasinet. För att ta sig ut behövde de lösa ledtrådar som gav dem koden till dörren.

Frågorna utgick från lärandemålen för bibliotekets introduktioner och krävde bland annat att deltagarna kunde tolka referenser, söka i bibliotekskatalogen Primo, förstå var en bok står uppställd och öppna en e-bok. Frågorna innehöll också klurigheter utan koppling till kunskap om biblioteket och informationssökning som chiffer, en rebus och ett sudoku.

Vårt Escape room gjordes i Google Forms och beräknades ta ca 45 minuter. För att deltagarna inte skulle kunna gissa sig till rätt svar utformades de flesta uppgifter som fritextfrågor med ett enda korrekt svar. I de fall vi använde flervalsfrågor var deltagarna tvungna att svara på en extra fråga innan de fick försöka igen.

Under hösten 2020 användes Escape room som biblioteksintroduktion på två program. Ett program genomförde det i ett fysiskt klassrum och det andra i Zoom. Studenterna delades in i grupper om 3-5 deltagare. I zoom användes break-out rooms. Bibliotekarierna fanns tillgängliga för att svara på frågor och ge ledtrådar när någon grupp kört fast.

Vid de flesta tillfällen blev den första gruppen klar efter ca 35 minuter, men några skulle ha behövt längre tid än de avsatta 45 minuterna, särskilt i Zoom. Varje tillfälle avslutades med en kort gemensam genomgång för att summera vad de lärt sig, ge studenterna möjlighet att ställa frågor, och besvara en utvärderingsenkät.

Results/observations/lessons learned

Studenterna var generellt sett nöjda och tyckte att Escape room var en rolig och lärorik undervisningsaktivitet. Att samarbeta i grupp uppfattades också som något positivt. Studenterna angav att de lärt sig söka information, navigera på bibliotekets webbsida och använda e-böcker, vilket överensstämmer med våra lärandemål. Genom Escape room var de aktiva och utförde själva de olika momenten, vilket ger förutsättningar för ett bättre lärande.

I utvärderingen framkom att en del frågor var otydliga. Vi justerade löpande de frågor och ledtrådar som behövde förtydligas. Samtidigt bygger formen Escape room på att gruppen tillsammans löser problem och frågorna får inte vara för enkla. Flera studenter betonade också att det var just svårigheterna som gjorde det kul. Några studenter tog upp att det är lätt gruppen fokuserar helt på tävlingsmomentet och inte tar sig tid att förstå de olika momenten. Några uttryckte också att det var svårt att se till att alla i gruppen hängde med och deltog aktivt, framförallt i Zoom.

En svårighet var att ge tillräckligt tydliga inledande instruktioner, både i klassrummet och i Zoom. I Zoom måste läraren dessutom besöka varje breakout room för att få samma överblick som man får med ett ögonkast i klassrummet.

Take-home message

Vi kommer att fortsätta att använda oss av Escape room för biblioteksintroduktionerna. Vi tror att denna form vore lämplig för en engagerande och lärorik introduktion även till andra ämnen.

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Titel: Lärares och studenters åsikter om lärosalar

Nyckelord: fysisk lärmiljö studenters åsikter lärares åsikter

Presentationsformat: Poster

Projektets fas: Pågående

Författare:

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Syfte och bakgrund

KTH renoverar löpande lärosalarna med ny teknik och ny inredning. Lärosalarnas utveckling och användning tillhör KTH:s prioriterade frågor inom utbildningen som det inrättats kollegiala tvärgrupper, så kallade PriU-grupper, för att driva [1]. PriU-gruppen Lokaler, schema och planering [2], bestående av lärare, studenter, arkitekter, administrativ och teknisk personal, arbetar för att lärosalarna ska fungera så bra som möjligt för undervisningen. Den fysiska arbetsmiljön är viktig för både studenter och lärares välmående och prestation; samtidigt är det viktigt att ta in olika perspektiv när man designar nya lärmiljöer [3]. För att arbetet med lärosalarna ska prioriteras rätt har PriU-gruppen genomfört två enkäter om lärosalarna och deras användning i syfte att hämta in synpunkter och preferenser från både studenter och lärare.

Genomfört arbete/arbete på gång

Den första enkäten gick ut till studenter i maj 2019. Den genomfördes som en del av en obligatorisk enkät i de programsammanhållande kurserna för alla studenter i årskurs 1, 2 och 3 på civilingenjörsprogrammet i datateknik och i årskurs 1 och 2 på masterprogrammet i datalogi [4]. Totalt 786 studenter från fem årskurser svarade på enkäten. Vi har tyvärr inte haft möjligheten att skicka ut enkäten till andra program ännu.

Den andra enkäten skickades ut till KTH:s lärare under perioden 17 februari-13 mars 2020. Lärare informerades om enkäten via inbjudan från studierektor, puff på KTH-intranätet och anslag i alla nyrenoverade salar i huvudbyggnaden. 92 lärare svarade. Enkäten avslutades precis innan campus stängdes på grund av pandemin.

Båda enkäterna sammanställdes sedan av den första författaren och har presenterats i en diskussionsgrupp på storträffen 10 maj 2020. Sammanställningarna finns tillgängliga på PriU-gruppens webbsida [2].

Resultat/observationer/lärdomar

Lärarenkätens svar visar att lärare bland annat föredrar ljusa och välutrustade föreläsningssalar. Bland övningssalarna lyftes särskilt U-husets luftiga och flexibla salar fram. Enkätsvaren visar också tydligt att fungerande teknik och inomhusmiljö är avgörande för om salen anses bra eller inte. Brister i ventilation och dålig sikt på grund av låga tak och pelares placering i rummet i bland annat M- och V-husen är särskilt framträdande bland lärarnas svar.

Studenterna på datateknik föredrar att ha föreläsningar i salarna E1 och D1. Bland övningssalarna lyfts flera E-salar fram tillsammans med salarna i U-huset som särskilt tillfredsställande. U-salarna värderas också som generellt bättre än övriga salar. De kvaliteter hos lärosalarna som flest studenter (över en tredjedel av respondenterna) vill se att KTH prioriterar att förbättra är i tur och ordning luften, tillgång till eluttag, sittkomforten och temperaturen. Vi blev överraskade av att inomhusmiljön och basal sittkomfort ansågs prioriterat av fler studenter än till exempel teknik, akustik och flexibel möblering. Flera av fritextsvaren lyfter fram att lärarna behöver bli bättre på att hantera teknik såsom projektorer och mikrofoner.

På vår poster presenteras båda enkäterna i diagramform och tabellform, och representativa fritextsvar återges.

KTH:s arkitekt och IT-avdelningen har redan börjat använda enkätresultaten i sin planering av renoveringar och utrustning av lärosalarna. PriU-gruppen har haft nytta av enkätsvaren i arbetet med att ta fram mål för utveckling och användning av KTH:s lärosalar. Projekt för att ge stöd till lärare om hur tekniken fungerar pågår.

Budskap

Att lyssna till studenter och lärare är viktigt, även vad gäller lärosalar. Att inomhusmiljön, såsom ventilation, temperatur, belysning och möjligheten att reglera dessa är av stor betydelse för både lärare och studenter är tydligt. Inomhusmiljön kan ha stor påverkan på både lärande och prestation [5] och har därför hög prioritet vid renovering av lärosalarna. Kommande renoveringar av bland annat huvudbyggnadens lärosalar kommer, med stöd av undersökningen, att ha fokus på flexibilitet.

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Title: Att skapa en digital lärmiljö för att bilda (samhällskritiska) ingenjörer: Digitala verktyg och pedagogiska utmaningar

Keywords: Digital lärmiljö, Pedagogiska verktyg för undervisning, ,

Presentation format: Workshop

Stage of the project: Mid stage

Authors:

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[1]ABE, Architecture And The Built Environment

Background and purpose

Som andra delar av KTH har Coronapandemin påverkat utbildningar vid avdelningen för historiska studier av teknik, vetenskap och miljö kraftigt. Avdelningens två största kurser – Samhälle, kultur och industri i Sverige ur ett historiskt perspektiv (AK1213) och Energisystem i Samhället (AK2207 och AK2209) – byttes fullständigt till digital undervisning.

I den här workshoppen kommer vi att visa hur vi har betraktat de här utbildningsmålen under höstterminen 2020 genom att använda nya lärmetoder och digitala verktyg samt utmaningarna vi påträffade.

Organisatörer av workshoppen (alla affilierade vid historiska avdelningen) är:

Siegfried Evens: ordförande

Katarina Larsen: forskare, kursansvarig Swedish Society and Industry in Historical Perspective (AK1213)

Kati Lindström: forskare, kursansvarig Energisystem i Samhället (AK2207 och AK2209)

Per Högselius: professor, grundutbildningsansvarig

Nyckelbegrepp: **Digital lärmiljö, Pedagogiska verktyg för undervisning**

Finished work/ongoing work

Fastän vårterminen karakteriserades av ett krisläge där vi behövde ställa om med kort varsel, har vi hunnit att förbereda oss för fortsatt digital undervisning under höstterminen genom att använda nya pedagogiska taktiker och verktyg.

Swedish Society är en kurs som introducerar internationella ingenjörstudenter till det svenska samhället och diskuterar hur förändringar i kultur, ideologi och politiska ideal har format och omformat svensk stadsplanering, teknologi och industri. Energisystem i Samhället består av svenska studenter i programmen Energi och Miljö och Civilingenjör och lärare (CLGYM) och fokuserar på den historiska utvecklingen av olika energisystem. Båda kurser har alltså olika mål men de delar ett viktigt syfte som är unikt på KTH: **att utbilda studenter om hur de kan läsa, analysera och skriva akademiska texter på ett (samhälls)kritiskt sätt**. Kritisk reflektion har en lång tradition och är en viktig del av undervisningen vid KTH, som

diskuteras i Larsen & Gärdebo 2017, när en ny ingenjörsroll växer fram för att hantera nya samhällsutmaningar.

Results/observations/lessons learned

Baserat på praxis, våra egna erfarenheter samt feedback från studenterna kommer vi dra **tre lärdomar** vad gäller digital undervisning i teknikhistoria. Våra kurser gavs fortfarande när det här bidraget skrev så nya lärdomar och tillägg kan göras.

1. Den här situationen tvingar oss att tänka på **studentens perspektiv**. Att erbjuda en mångfald av undervisningsformer- och metoder behövs ännu mer i ett digitalt läge för att motivera studenter och tillgodose individuella lärbehov. Därför behövs digitala arbetsformer – både on-screen och off-screen – som är interaktiva.

2. Olika digitala **verktyg** behövs för att utnyttja den digitala kontexten optimalt. Att bara kopiera en fysisk kurs till Canvas räcker inte för att uppnå läromålen. Verktyget ’Nearpod’ är mycket användbart för att hjälpa studenter att arbeta med och förstå komplicerade akademiska texter samt att göra föreläsningar mer interaktiva. Lärande utanför klassrummet vid exkursioner kan ersättas av en individuell ’digital tipspromenad’ genom ett ’gps-quiz’.

3. En kontinuerlig och inkluderande **feedback-loop** mellan läraren och studenten är ännu viktigare i ett digitalt läge. Det här omfattar frekventa ’check-ins’ hur studenterna mår genom ’polls’, diskussionstavlor, peer-review, tydlig skriftlig feedback på uppsatsutkast, och tillfällen att göra direkta utvärderingar. Detta tar även tid för lärare och kurssamordnare.

Däremot har vi också inträffat **tre utmaningar**:

1. En digital omställning kräver **mycket jobb** och är inte alltid kompatibel med andra uppdrag som forskning eller doktorandstudier.

2. Att använda olika digitala verktyg medför mer **kursadministration**. Mer och snabbare stöd från KTH för flera nya verktyg och en bättre integration i Canvas behövs för att lösa det problemet.

3. Trots alla nya verktyg och feedbackögonblick stannar det svårt att **’följa’ alla studenters lärframgång och deras förväntningar**. Studenter har ett större eget ansvar för att bevaka dess egen lärframgång och att kommunicera problem, och är inte alltid medvetna om det.

Take-home message

Genom en workshop vill vi informera våra kollegor **hur vi klarat den digitala omställningen vad gäller textförståelse, skrivkunskaper och (samhälls)kritisk kompetens**. Däremot blir workshoppen inte enkelriktad utan **en livlig diskussion** till vilken vi vill inbjuda andra lärare. Vi kommer även att bjuda in lärare att dela erfarenheter av hybrid-format av kurser som anpassats till distansundervisning (exempelvis inom produktutveckling och design). Vi tycker att ett sådant samarbete är särskilt viktigt inför utmaningarna av hybrid undervisning, vilket är troligen den nästa omställningen vi kan förvänta oss.

Workshoppen kommer att bestå av tre delar:

1. Första delen är en introduktion till undervisningsmålen vi strävade efter och kursernas innehåll samt avdelningens bredare undervisningsstrategi. Vi ger också en kort översikt av de olika verktygen vi använt.

2. I andra delen ger vi en interaktiv demonstration av två verktyg: Nearpod (både student-paced och live) och ’quiz-gps’.

3. Vi avslutar med en allmän diskussion för att dela erfarenheter och framåtblickar.

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Title: Spaces for Teachers', Students' and Staff Participation in Education Development - The Legitimacy and Authenticity Approach in Storträffen for New Participants

Keywords: Faculty involvement, Staff involvement, Student involvement, Storträffen

Presentation format: Presentation

Stage of the project: Finished

Authors:

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[2]EECS, Electrical Engineering And Computer Science
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[4]CBH, Engineering Science In Chemistry, Biotechnology And Health

Background and purpose

Denna studie presenterar hur nytillkomna deltagare vid Storträffen beskriver aspekter om delaktighet, legitimitet och autenticitet i utbildningsutvecklingen vid KTH. Storträffen samlar en växande skara KTH:are och vi anser att det är angeläget att denna utveckling upprätthålls och att de uppföljande utvärderingarna fortsatt signalerar att arenan håller måttet.

Det finns en stor medvetenhet om de utmaningar högre utbildning står inför, gällande både förändringsbehov [1], och förutsättningar att arbeta med förändring och utbildningsutveckling [2-4]. En överhängande återkommande slutsats i större transformeringsarbeten är att den stora utmaningen är att nå ut till fler universitetslärare och andra inom lärosätena relevanta aktörer, såsom utbildningsadministrativ personal, studenter, pedagogiska utvecklare och utbildningsforskare, som aktivt samarbetar i deltagande kulturer [5, 6].

Vanliga barriärer för den högre utbildningens utveckling anses vara skeva belöningsstrukturer och värdesättande bland universitetens kärnuppdrag tillika en betydande segregation av dessa kärnuppdrag [7, 8]. Vidare anses man ofta få ge vika för organisatoriska hinder när organiskt framväxta samarbetsformer börjar ta form, och man återgår ofta till en inrotad individualisering runt lärarrollen [9].

Vid KTH har vi under de senaste 10 åren strävat efter att utmana dessa barriärer och hinder genom att successivt koppla in organiskt utvecklade nätverk och arenor för utbildningens utveckling till de traditionella och formella strukturerna [10]. Förhoppningen är att detta ska balansera våra normer och värderingar kring värdesättande, belöningar, kunskaper och resurser, och vi bedömer att det därför är viktigt att kontinuerligt stärka synergier och sammanfogandet av KTH:s olika kärnuppdrag. En utgångspunkt i vårt kontinuerliga utvecklings- och utvärderingsarbete är att ju fler av lärosätets aktörer som

deltar i arenorna, desto bättre kan det bli. Därför fokuserar vi i denna studie på att belysa upplevelser bland dem som är helt nya storträffsdeltagare, för att lära oss bättre om hur vi kan skapa rum för nya att delta i arenorna för utbildningens utveckling vid KTH.

Finished work/ongoing work

Vi följer kontinuerligt upp storträffen, genom enkäter till storträffens deltagare, bordsledare, inledningstalare och övriga arrangörer. Vidare, har vi utfört fokusgruppsintervjuer med erfarna utbildningsledare och pedagogiska utvecklare vid KTH, samt THS chefer för utbildningsinflytande, under 2019, vilket har en stor vikt i vår analys. Under januari 2021 kommer vi dessutom ta våra studier ett steg djupare genom att intervjua nytillkomna deltagare vid den senaste storträffen i december 2020. Vad hade de för uppfattning om storträffen före de kom, och hur förhåller sig den bilden till den faktiska upplevelsen. Hur beskriver de delaktighet, dvs hur möjliggörs lärande och förankring? Hur betonar de legitimitet, dvs hur vi undviker att nya saker bara kläms in för att någon säger det, och istället att förändringarna spelar roll, att de är rimliga, sanningsenliga och accepterade?

Results/observations/lessons learned

Våra studier visar att essensen av erfarna utbildningsledares, pedagogiska utvecklares och chefer för utbildningsinflytandes syn är att de anser att de mest långsiktiga strategierna för förändring innebär att vi som organisation bör prioritera just delaktighet, legitimitet och autenticitet, bland samtliga aktörer som är involverade i utbildning. En sådan utveckling stärker betydligt bättre möjligheterna för utbildningsledare och andra som arbetar för utbildningens utveckling att uppnå kvalitet i sina arbeten, till skillnad från att exempelvis fokusera på att i pappersform stärka det formella mandatet hos specifika utbildningsledarroller eller utvalda miljöer, eller att isolerat arbeta för utvecklingen av pedagogiska meriteringssystem.

Take-home message

Inget top-down-beslut slår en bottom-up-vilja; samtidigt som bottom-up-viljan är beroende av bra top-down-beslut. Så om du vill ha ett bra universitet med god utvecklingsmiljö, se till att bemanna det med bra lärare och annan personal, och se till att försörja dem med goda möjligheter till nätverkande och kompetensutveckling där även studenter bör ingå. Låt också fokus i utvecklingsarbeten ligga på denna communitys tolkningsarbeten av större utvecklingsområden, såsom exempelvis jämställdhetsintegration.

Vi tror att vi som organisation har åstadkommit en del det senaste decenniet för att hörsamma detta och utveckla oss till att bli än bättre hörsammande . Det successiva frambyggandet för deltagande i våra öppna nätverk och arenor har under Covid-19 visat sig vara mer behövligt än någonsin tidigare. Därför måste vi fortsatt vara inkluderande och värna om att vara bra på att ta emot nya deltagare.

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Title: System perspectives on program development

Keywords: CDIO, program development, validation, systems engineering

Presentation format: Presentation

Stage of the project: Mid stage

Authors:

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Background and purpose

Due to various influences of a dynamic context of universities and society there are many changes that are required in education and many goals to relate to. For example: new pedagogical knowledge, didactics and technology for learning, tougher requirements for throughput, new rules for examination and goals, new societal demands for equality and sustainability, requirements for goal related grading. Together this has resulted in that it is increasingly complex to make changes, develop, design, improve and validate education programs. If education programs are likened to systems, and the task of changing them likened with engineering tasks, then tools and models in systems engineering could be applied to support development also of education programs. The purpose of this paper is to investigate systems engineering processes and models to support development for education programs.

Finished work/ongoing work

In this study, the development and continuous improvement of CDIO is compared for two programs in different life cycle stages. For comparison a self-assessment is performed using the CDIO standard 2.1.The method for investigation has been to relate and reflect our own experiences to the framework from systems theories and systems engineering and where applicable apply this to education programs and the challenges encountered in a highly dynamic context in universities and in society.

Results/observations/lessons learned

This initial work of making draft system models and life cycle models and reviewing processes for systems engineering has been clarifying and the authors are confident that a more structured analysis with more elaborate cases this will support our practice and daily work. Not the least it has increased an awareness to involve teacher teams, administration, students in all activities. To increase system thinking and system views is something we require in our engineering education, in accordance to CDIO. That this is not a common language in our own work and development is a weakness. This initial paper alone will help communicating the need for this and also present ways of working with our peers and students.

When comparing the programs differences of the change management required for the two is due to the various life cycle stages. This approach is stated to be broader than flipped classroom. It is a flipped education. Piecemeal modules and systemic games is also suggested to contribute to “old structure” programs by facilitating integration and managing progression as a change agent and proof of concept for others to follow without much preparation.

Across the assessment there is the word of product. For the new program this needs to be replaced with production and production system since that is an intended focus and delimitation of the program that product development per se is not included. Another comment to CDIO is the missing R in the last Life cycle stage emphasized particularly with respect to sustainable production.

Take-home message

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