Experiment, evaluate, reflect, and share.

Application for “Meritter underviser”.

Per Lauvås jr. Kristiania University College. November 2021

Introduction

Teaching young people how to write computer programs, interact with databases or participate in ICT projects is a privilege. The Norwegian industry is, and will be in the foreseen future, in short supply of people with ICT skills and knowledge. According to a recent report from Samfunnsøkonomisk analyse [1], the Norwegian industry will need far more workers with ICT education than our educational system is able to provide today. This need for future ICT candidates is my main motivating for teaching ICT subjects. It is meaningful to be able to contribute to releasing candidates into a workplace where there is critical need for them.

Teaching courses when entering academia is a challenge. It helps when you are taking over existing courses and have an already created path where the learning material from last year is present, and the delivery is based on lecturing. You can edit and adjust slides and continue the work from the former lecturer. You may also keep the curriculum from last year, as well as the assignments. It is a safe path to take. The students seem to enjoy lectures and you, as the lecturer, have good control on what will happen next. It is also likely that the lecturer will have a lot of experience from the lecturing setting from his or her own time as a student. And as "I turned out all right", so should my students.

This was my strategy when I started teaching as an assistant professor in Higher education in 2013. The path was there, and I walked into a default pattern of delivering two hours of lectures followed by two hours lab. Teaching was new and challenging, and it felt safe to step into the current teaching culture. Giving lectures was fun. After some trial and error, I felt I found a good balance between talking and engaging the students in activities. So why change something that is working? Both me and my students were happy. Well, as educators we should continuously try to make changes, evaluate, reflect, share, and try again. It will develop our own teaching and hopefully have value for students and other educators. It is also what makes teaching fun and interesting.

The purpose of this application is to document my teaching philosophy and how this has evolved throughout my years as an educator. I will describe how I introduce new elements into my teaching, how I measure the outcome, how I reflect and how I share my findings. I will also document my work on industry relevance and cooperation. References to own research is placed within the pedagogical CV (appendix 1) and cited (names, year). Additional references are placed in the references section and cited [<nr>].

Flipping the classroom

When starting teaching in academia, I focused more on providing good lectures than anything else. All eyes were on me and preparing well for lectures was a personal protection from unwanted or unexpected incidents. I also believed that good lectures were essential for student learning. This has changed. Today I believe that what *the students do* is much more important than what *I do*. This follows a student-centered view on teaching and a constructivist view on learning.

The change in my teaching and planning has evolved gradually. Together with a Styve at NTNU Ålesund, we used our networks to find people in academia who had experimented with other ways of delivering courses (see Lauvås and Styve 2017). Drastically changing my own way of teaching was scary. I wanted to learn from those who already had experience on moving away from the standard lecturing format within IT studies.

One of our findings was that many students believe lectures are the most important part of a course. If it is one thing they need to prioritize, it is the lecture. It is where the teaching and learning takes place. One educator described how students got confused when he had a course where lectures and labs where mixed in larger learning sessions. Students wanted to know at what time the lecture- and lab parts occurred in the session. They didn't want to miss the lecture.

Another interesting finding was regarding the cost of flipping the classroom. Creating learning materials, often videos, could be regarded as an obstacle to flipping the classroom. How can an educator find time to produce videos when time is limited? It is simply more time effective to do the lectures you did last year. One educator had the opposite experience when flipping the classroom for the first time. He was given a course he had never taught before and had limited time to prepare. He realized there were high quality, publicly available, learning resources online. He could use those materials and focus on *student activity* on campus in the flipped classroom setting. Flipping the classroom saved him precious time.

I started experimenting with Flipped Classroom and documented what we called a *transition to Flipped Classroom* (Lauvås and Styve, 2018). The paper documents how it is possible to introduce elements from flipped classroom in a course, as opposed to do a complete flip in one go. For me, it was a drastic change to step away from lecturing, so I chose to start by flipping most of my sessions, but not all of them. I reused most of my learning resources as opposed to create a complete new set of videos. The following table displays the setup (number of hours in lectures and labs) for the 12 sessions in the course. LE=Lecture, LA=Lab (Table 1 in Lauvås and Styve 2018):

1	2	3	4	5	6
2LE+2LA	3LA+1LE	3LA+1LE	3LA+1LE	3LA+1LE	2LE+2LA
7	8	9	10	11	12
3LA+1LE	3LA+1LE	3LA+1LE	3LA+1LE	3LA+1LE	2LE+2LA

As the course originally had a 2LE+2LA setup, the total number of lecture hours was reduced from 24 to 15. And the concluding 1 hour lecture (+1LE), was not really a lecture, but a gathering where students could raise questions and provide feedback on the session. Student preparation (using books, slides and videos) replaced the most part of lecturing in earlier deliveries of the course. The students were more activated through preparation work and more hours in lab.

When flipping the classroom for the first time, I wanted to see how this was received by the students and how it effected their learning. The latter is difficult to assess. The former was possible as I could

compare students' satisfaction with earlier cohorts. The following table displays the result (Table 2 in Lauvås and Styve 2018, likert scale 1-6):

Statement	2013	2014	2015	2016	2017
I think this topic has a good content and structure	4.4	5.1	5	5	5
I think lecturer is capable of communicating the subject matter in this topic.	4.3	5.4	5.2	5.4	5.3
I have had good learning outcome in this topic.	4	4.6	4.9	4.9	4.7
Overall, I am pleased with this subject.	4	4.8	4.9	4.8	4.9
I think the lab sessions are well executed	4.4	4.8	5	4.8	4.5
I find the supervision useful	4.3	4.5	4.7	4.9	4.6

We see from the table above that the 2013-students rated the course lower than later cohorts. That may easily be explained by the fact that 2013 was the first time I taught in higher education. When comparing 2017 (the year of the first flip) to the three previous years, we see that the scores are pretty much the same, except for a small drop in "I think the lab sessions are well executed". It is reasonable to think it has to do with students having to prepare beforehand, as opposed to go straight from a lecture to the lab session.

If we look at the exam results distribution, we can see that they were pretty much the same as for earlier cohorts: (Table 6 in Lauvås and Styve 2018)

Grade	2013	2014	2015	2016	2017
A	11 %	7 %	13 %	6 %	13 %
B	17 %	19 %	22 %	20 %	15 %
C	25 %	25 %	36 %	33 %	35 %
D	23 %	20 %	24 %	19 %	19 %
E	17 %	20 %	1 %	10 %	7 %
F	7 %	8 %	4 %	12 %	10 %

Flipping the classroom is not something that automatically will make the students learn more (or receive better grades). Foldnes[8] did an experiment on this where he flipped the classroom for one student group and not the other. There was no statistically significant change in the grades. But when he did the same experiment and introduced collaborative learning activities in the flipped lab session, the students got better exam results. For me, this earlier research, and my own experience in flipping the classroom made me believe it is possible to improve incrementally. When I had rearranged the structure of my course, I was ready to start focusing on what the students should be doing, and how student interaction should be an important part during the increased amount of time they spend in labs.

Students are all individuals, and FC is not highly regarded by every student. After flipping the classroom, I asked the students how they would prefer 4 hours in a session to be distributed, and in what order. The following table displays the result (Table 4 in Lauvås and Styve 2018):

Preferred 4 hrs lecture/lab distribution	Percentage
2 hrs lecture —> 2 hrs lab	29
2 hrs lab —> 2 hrs lecture	18
3 hrs lecture —> 1 hr lab	7
1 hr lab —> 3 hrs lecture	0
1 hr lecture —> 3 hrs lab	18
3 hrs lab —> 1 hr lecture	15
Unanswered/Do not know	13

Only 15% of the students preferred the setup mainly chosen in the flipped course (3LA+1LE). The most preferred setup (29%) was the traditional 2LE+2LA, which they experienced in all other parallel courses that semester. If we combine traditional (lecture first) and flipped variants (lab first), we see that lecture first (54%) was more preferred than lab first (33%). This is not a big surprise. Flipped classroom puts more responsibility on the students. For a session to work, they must prepare in advance. Not all students do that (see Lauvås and Styve 2018). For me, these numbers do not scare me away from flipping the classroom moving forward. It tells me that I have a job to do in continuously improving my way of flipping the classroom, but also that I need to work on student understanding of learning and the misconception that lectures are the most important element in higher education.

Constructive alignment

The move away from lecturing went further during the Covid pandemic. When planning for a Covid semester, where campus activity would be limited, I could not justify spending campus time lecturing. All campus time was dedicated to student activity with supervision from TAs and me. Instructions and preparation material were pre-recorded. During the semester I found myself planning a session by looking at the ILOs and preparing and solving relevant assignments. And afterwards asking; what do the students need in preparation to solve these assignments? This was a contrast to earlier planning where I normally would start with ILOs and how to present relevant content – and at the end prepare assignments. Pre-recorded learning material published early, combined with an online collaboration platform increases the flexibility for the students. Some students even argued that the pandemic situation helped them in their studies because of the increased flexibility.

Following the principle of *constructive alignment*, ILOs, assessment, and teaching and learning activities should be aligned. Within IT courses, we have a majority of functional learning goals. In a computer programming course, we assess the student primarily by the code he/she is writing. The activities in the course should evolve around writing code. When I replaced the traditional 3hrs school exam in “Advanced Java” with portfolio (see Lauvås 2015), the motivation was not intentionally to fit a constructive alignment framework, but looking back it fits nicely anyhow. Earlier, the students wrote code on a piece of paper on the exam after having used an industry IDE

(Integrated Development Environment) throughout the course. By switching to a portfolio, the students worked on the code (portfolio) and gave and received feedback with their peers. An ILO regarding code review was added to the course. The activities in the course, the assessment and the ILOs became better aligned.

Learning environment

Teaching introductory programming subjects is a challenge. Approximately 1/3 of all students worldwide fail the introductory programming course in higher education [12][13]. When I was assigned to teach it for the first time, I discovered one of the benefits of teaching a subject topic that is delivered worldwide in many institutions: There will be an extensive body of work describing the challenges and possible solutions to teaching the subject within existing research.

I chose to follow an “Object first”-approach and the BlueJ-project with a lot of related research (e.g. [14][15]). BlueJ is a dedicated coding environment tailored for teaching and learning. A lot of the more advanced features of an industry tool is removed to make it easier for the inexperienced student to start coding. The BlueJ project also includes a network of educators who share experiences using BlueJ in their teaching.

Although I believe BlueJ was a success when it came to introducing an object-oriented programming language to inexperienced students, some of them failed the course. I wanted to understand more about the underlying reasons behind failing the course. I invited a Master student, and together we did a study interviewing students who failed (or got an E) in the course (see Lauvås and Lorentzen, 2016). The findings made me more aware of certain elements within the learning environment in a coding course:

- Introducing larger changes in a course will have an impact on how teacher assistants (TAs) interact with students. In this case, the TAs (successful students from the previous cohort) had used an industry tool when coding. Now, they had to learn a new, less industry relevant, tool to help the students. That could lead to challenging situations in the lab sessions.
- It is easy for a student to see how other students can solve programming tasks that they, themselves, are not able to solve. This may create embarrassment and make a student reluctant to ask for help because they know they are lagging behind. As this student explains the feeling in lab sessions(Lauvås and Lorentzen, 2016): “When something is unclear from Chapter 2, then it's sort of embarrassing asking too, right? You would not want to go back there like that, like: "Hah, you do not even know that?" Right? So I was like… I did not want to attend there anymore.”
- The same issue would come up during lectures. An eager student would ask a difficult question, and it would paralyze a large portion of the audience.
- Parallel subjects in a semester will have certain larger tasks that will occupy a large portion of time. This may result in students not being able to keep up with the tempo in other courses. And within some ICT subjects, it is hard to recapture missing pieces as new topics may build further on earlier topics. Students described this as “falling off” and not being unable to get back on track.

These findings made me adjust some of my teaching habits. As an example, if I get a difficult question in class, I always tell the student to come talk to me about that question in the next break and invite others to join. And I make it clear that the question is not expected to be understood at the current time in the course. And when I use mandatory coursework, I treat them as mandatory coursework, and not mandatory success. That means that they need to invest time in a task, but if they fail to

complete the task, they can describe the problem and receive additional help. They should not put an unreasonable amount of time into a coursework so that they are unable to cope with activities in parallel courses (see Lauvås and Sandnes, 2020).

It also made me reflect on how we introduce our students into our programs. I have been involved in multiple first-semester courses with hundreds of students entering large auditoriums and crowded working areas. I believe one of the main factors deciding if a student will succeed in their studies, is if they get established in a social network. Some students find that during their "fadderuke", but some don't. I always emphasize collaboration in groups during my lab sessions – especially the first one (see appendix 3 for an example). But I do believe we should *facilitate* group work, and not always demand it.

Assessment

The Covid pandemic has changed assessment in our faculty to a large degree. When the traditional school exam was no longer an option, other forms of exams appeared. I believe it is mainly a change for the better. In home exams, assignments involving lower levels of the SOLO taxonomy is no longer possible. It makes no sense to ask the students if they remember something specific when they have all aids (the Internet) available.

Assessment is not only (and should not only be) summative. In a constructivist learning perspective, the students are all individuals with different backgrounds and prior knowledge and skills. Formative assessment is important to help each individual student moving forward in their individual learning context. My introduction of portfolio assessment was an attempt to provide formative assessment. When introducing portfolio with peer feedback, I needed some justification using relevant existing research. The students were quite skeptical in the beginning to provide and receive feedback from peers (and no teacher directly involved). Hattie [2] was an easy find when searching for relevant literature on feedback. What I believed made the students buy into the concept was the understanding that *providing* feedback could be even more fruitful than *receiving* feedback. Realizing that providing feedback to a peer is a meaningful *learning* activity was important. It was also important for the learning environment in the class. It emphasized that the students themselves are the most important part of the learning environment.

Another attempt on providing formative assessment (in large classes) is LearnER. LearnER is developed by USN students under supervision by Kristoffersen. I have been a part of the project since 2017 (see Dæhli et al. 2018, 2019, 2021). Figure 1 displays a stylized view of the user interface.

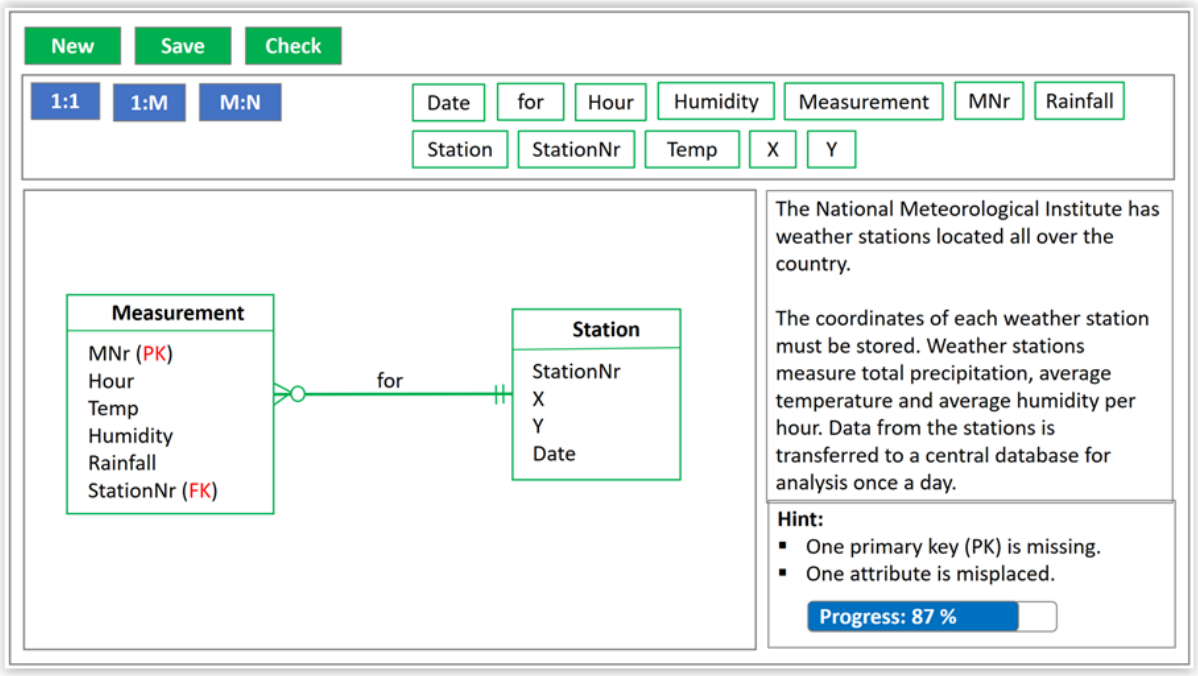


Figure 1: Stylized view of LearnER user interface.

An interesting part of the project is the goal of providing the students with automated feedback. Our database course at HK includes hundreds of students, and it is hard to provide individual feedback to everyone. In LearnER, we attempt to automate the feedback using textual responses and visual cues to help the student moving forward - *feed forward*.

Students will have different opinions of what they find to interesting or not. Providing all students with the same assignments (or cases) will not be a good match for everyone. I believe we should try to let students move in relevant directions they find interesting – tapping into *intrinsic motivation*. As an example, I introduced video portfolio as an exam option in the same database course. In the new portfolio exam, the students themselves chose the case. They would pick a case they were interested in. It could be an arrangement for an online gaming tournament, recipes for cupcakes, or anything else. The whole idea behind the portfolio was this subjective choice in finding an interesting case. Within the case, they produced videos on different topics. They received feedback on the videos. The target group was “someone interested to learn about relational databases”. By choosing that specific target group, the videos could be used in teaching students in subsequent years. I strongly believe Open Educational resources (in this case created by students) is something we should strive for within higher education (see Lauvås 2015). Figure 2 displays an example of a modelling video from the first group of students choosing video portfolio. The selected case is a database holding data regarding vending machines. The video is still accessible on YouTube and is still in use as a learning resource in the database course.

Figure 2: Screen capture from student video portfolio element.

Video portfolio as an exam option was piloted for three years. I summarized the results of the pilot in an experience paper (Lauvås, 2021). Only 10% of the students chose the video portfolio, but those who did were very clear that they learned more than those who chose the school exam. First, they invested more time throughout the semester as they continuously worked on their portfolio. Secondly, as the target group was “someone interested in learning about databases”, they really had to understand before they created the videos. This may be referred to as generative learning theory [9, 10] (cited in [11]) and *learning science by understanding*: "This generation requires active construction, so that learners take actions that purposefully utilize new knowledge to develop an understanding, thus making connections between new information and what they already know." In interviews with students having chosen video portfolio, one of them described the learning process like this (Lauvås, 2021):

“I thought, it’s not for me [video portfolio]. But then I thought I should try making that video. It was a video about join and group by, if I remember correctly. How we create the queries. But when I made it, I was very unsure about group by. So then I thought, ok, I can make a video about it. And then I started reading about group by. And read more and more and more until I understood it. The problem was that I did not have time to make the video, so I did not make any video there and then. But I had understood so much more of join and group by that I thought, ok, this might be something for me because then I really have to read through everything and try to understand instead of just reading through. [...] Then I started making those videos, and adding them to a portfolio. So I think it’s a very effective learning method instead of taking a written exam. Because I feel like I have to work twice as hard as if I had just taken the exercises every day, and that was it. Because you have to understand why it’s like that. Because you have to explain it in your own way with your own database and your own modeling, your own db script, your own normalization. So you have to make everything yourself. And that’s what I think is great. Because now, I’ve learned all about it.”

In a smaller feedback setting, such as being a supervisor for project groups or individual students, feedback becomes somewhat different, although the general principles of feedback remain. I find it hard not to provide direct answers or ideas as opposed to what I should aim for; trying to make the group or student self-assess their own work, self-reflect and re-think how they should move forward. I believe there are multiple reasons for this. First, I think many students would like (and expect) to have direct feedback on what needs to be improved, and how. They would rather have feedback providing direct value to the goal at hand: "Tell us what we can do to obtain a better grade." And for the educators, it will surely be time effective to tell them just that. It also feels good, as an educator, to be able to provide instant value. It is more time consuming for both parties to discuss *how* the student has arrived at the current situation or what the students themselves think would improve the current situation. Not providing direct answers is hard, but I believe it enhances learning and self-efficacy.

Mandatory coursework

Mandatory coursework is an interesting hybrid of feedback and assessment. It is not included as part of the final assessment in a course. But if you do not pass, you will not have access to the exam, and therefore fail the course. Mandatory coursework will also include the possibility of providing feedback (or feed forward) to the student. I have investigated the use of mandatory coursework in Norwegian IT education. Mandatory coursework is to a large extent in use (Lauvås and Sandnes, 2019), although there are significant variations among the different institutions. A common motivation for using mandatory coursework is to "force" the student into continuous work throughout a semester.

Having concluded that mandatory coursework is common practice, we further investigated how the students perceive them (Lauvås and Sandnes, 2020). A large majority of Norwegian IT students want mandatory coursework. They believe it contributes to their learning, but only within certain prerequisites. Mandatory coursework is mostly needed for technical subjects, such as computer programming. And the assignments should be practical, engaging, relevant for the upcoming exam and with just the right level of difficulty. Creating engaging assignments with the appropriate level of difficulty for all students might prove a difficult task. We also found that any coursework assignment may be highly appreciated by one group of students, and at the same time disliked by another.

When introducing mandatory coursework in a course in 2021, I used my earlier findings to try to find a meaningful learning activity that would be practical, engaging, relevant for the upcoming exam and with a suitable level of difficulty. Not an easy thing to do in a course with 500+ students. Part of the solution was to (as with the video portfolio exam option) let the students choose the case. In a constructivist learning perspective, where the students construct their own knowledge as opposed to acquire it, they will do so from their individual starting points. They individually have different skills and knowledge backgrounds, and they have different interests. By letting the students choose their own case, they can all start constructing new knowledge from something they know about and find interesting.

The mandatory coursework included modelling a database within a field of interest (individually, or in groups) (see appendix 4). Data is everywhere, so finding a case should be possible for everyone. Some of the selected topics included Pokemon, concert arrangements, a make-up store, Premier league football and Formula 1. The students modelled the data and provided feedback to a peer. The challenge with this setup is that not all students will be able to create such a model. I therefore created a plan B where I provided the case. The students could choose to deliver a model based on their own case, or a specific case regarding a fishing contest. When providing peer feedback, the

students having delivered their own case reviewed each other. Likewise, for those with the fishing contest case, but these students received a proposed solution before providing feedback. By doing so, the more struggling students got more help (or scaffolding) than those who managed to create their self-selected model. They received help in both learning activities - in creating a model, and in the feedback process.

Industry and working life relevance

Having spent 9 years as a developer in the software industry prior to landing a job in academia, I had a good understanding of what was relevant for the students to learn in their IT studies. As responsible for the computer programming specialization within Bachelor in IT, I identified software testing and code review as the biggest discrepancies between our study program and industry expectations.

An important change has occurred within software development in recent years. Now, software development is considered an incremental process with rapid update releases. Earlier, it was more common to have fewer releases and an intensive testing phase prior to the release. Automated tests and code review play a fundamental part in this change. To release increments often, automated tests are a must. These tests ensure that the code is continuously working as intended. And in the process of writing code, including tests, programmers review each other's code before it is included in the code repository.

During my time as responsible for the Computer programming specialization, these important concepts have been incorporated. In our programming courses, writing code also involves writing tests. And the students learn how code is developed in a continuous delivery environment including reviewing other developers code. Appendix 5 exemplifies how this has been incorporated as learning goals for the program.

I see my initial industry background as a strength in connecting our studies with industry expectations. That is also why I chose to take two years leave of absence to work as a software developer after five years in academia. I got to brush up my practical skills and gain new insight into current trends. But there are also other methods of exploring these trends.

Together with Raaen, I interviewed representatives from companies interested in hiring newly graduated computer programmers (Lauvås and Raaen, 2017 and 2021). The motivation behind the study was to see if there are elements within our programs that needs to be adjusted to make our candidates more attractive to the industry. It could be topics to address, or *how* we teach certain topics. The study provided two distinct answers to what was important to those who hire: The student must be genuinely interested in something relevant, and they need to be able to cooperate with others. If those two prerequisites are met, they can receive additional training in the company.

This was an eye-opener for me. Earlier I had been focused on preparing a program where the students had to learn all the right programming languages and techniques. Our study suggests that the most important thing is to nurture curiosity, interest and engagement in some direction or another. And they must learn how to cooperate with other students. I try to incorporate these findings into my teaching and revision of courses and programs (as exemplified with self-selected cases and peer review described earlier).

This new insight will affect my work moving forward. A recent example is the new act requiring two assessors on all A-F exams. My proposed solution is to have all first-year subject exams as Pass/Fail. Many colleagues argue that this will have a negative effect on student motivation. That could be

correct. But having P/F on all firs-year courses may also provide us with a possibility to change how the students think regarding learning and grades. After 13 years in the Norwegian school system, they have been trained to believe that the final grade is what really matters. It is the tool to get into the study of your choice. My research indicates otherwise when it comes to higher education. Those hiring will not look at first-year grades. They are interested in finding the right person - the engaged, motivated candidate who can cooperate with others. A first-year with P/F in all courses may let the student invest more time in subjects they find specifically interesting. And they may set aside time to work on side projects that are not exam related – preferably in cooperation with others. And if they do, my research indicate that they will be the highest ranked candidates when they apply for work.

Industry relevance is also about letting students to work on real work-life challenges. For four years I taught agile project management and deliberately invited industry partners to present cases to work on. It is easy an easy process to invite companies to collaborate with our students. For them to get 200+ students to work on their domain for a year brings a lot of value (see appendix 6). During those four years I got Gyldendal, DNB, kolonial.no and No isolation as collaborators. The latter is an example of introducing a collaborator with the purpose of societal benefits. No isolation is trying to fight loneliness, and is well known for having developed AV1, a robot that can be the eyes and ears for a child being away from school.

Sharing

During my time as an educator, I have explored new alternatives in my teaching regarding course structure, study environment, assessment and learning activities. I have continuously evaluated the results through interviews and surveys, and I have presented my results on relevant conferences (and journals). I have also tried to involve more faculty staff members to do the same. In 2018 I founded, and was the leader, of the first didactical research group within our university college (See appendix 7).

Peer supervision

As more faculty members are completing the Foundational course in pedagogy for higher education, more people have experienced peer supervision. We also have an ongoing project in my department on using peer supervision to enhance our teaching and reflect on our own and others teaching practices.

I find peer supervision to be an excellent idea, but a hard challenge to gain significant value from. My own experience from peer supervision was quite different from what I have discovered through literature. We found available slots in our calendars to visit each other. Prior to the visit, the educator to teach described the coming teaching session with learning goals, structure, and requests for specific types of feedback. After the teaching session, we filled out a template-based form and tried to focus on the initial requests for feedback (see appendix 8).

There was a good and “safe” atmosphere in our group. Nevertheless, given the situation, I believe the normal strategy in such a setting (mandatory activity in a mandatory course being observed by people you do not know) is to play it safe. You pick a *lecture* with a topic you know well, and you request feedback on structure, tempo, interactivity, variation etc.. This may provide valuable feedback, but it is all within the safe and default setting of a lecture.

I was hoping for a more exploratory motivation behind the teaching, where theory from the pedagogy course could be practiced with the support of the group. Not just in the observation part, but even more importantly during planning and debrief. Although deLange [3] describe some of the same challenges (limited exploratory talk), I believe the peer supervision context they are describing

in a similar course has some benefits. I believe a fixed group where everyone observes everyone is better than observing someone and have someone else observe you. And I believe discussions before and after the observation are critical. I understand that no one should be forced to teach in a way they do not feel comfortable with, but I believe there should be higher emphasis on *trying* to push educators out of the comfort zone and try something they have not tried before – with the support of the group and theoretical input from the course. And if the group is involved in the planning, hopefully the teaching may be viewed more as a group effort than an individual effort.

A setup, like the one I experienced, could have an opposite effect than intended. If everyone choses the *safe path* – a standard lecture format, it could strengthen the position of the lecture. "I see that everyone uses lecture when teaching. I guess we are all supposed to be lecturing".

Reflecting on peer supervision, I believe it is very hard to succeed in a mandatory setting. The participation must originate from intrinsic motivation, and I believe it is better suited when there is a specific topic to explore. "I want to try this. Can you help me prepare, observe and discuss?" And it can be useful if you want to try something that you know a colleague is already practicing. You may invite yourself to be included in a preparation, delivery and debrief cycle. This is something we are currently trying to achieve through our work in the didactic research group.

Pedagogical development

Looking back on my previous interventions in my courses, I see that they did not, at first, originate from a clear explicit pedagogical or psychological perspective or theory. They originated from a motivation of trying to improve student learning, but without a strong connection to explicit learning theory.

There are multiple explanations behind this. First, I did not have a broad knowledge about learning theories. Secondly, when I started writing scientific papers regarding my own teaching, I connected my work to existing research within my own field of didactics. I believe didactics within IT is not strongly connected to learning theory. At least, that is my experience. As an example, in our meta study on teaching software testing (Garousi et al. ,2020), only 8 of the 204 papers in the pool used a theory from learning and education science (chapter 4.8). Now, having completed the mandatory foundational course in education, I can reflect on how my earlier work can be described in relation to pedagogical theory - not to justify my earlier work, but to be more aware of my own view on learning.

An eye-opener for me, was reading Biggs[4]. I believe *constructive alignment* is easy to understand and functions well as a framework for teaching and planning. One specific element example is the recommendation of not using too many ILOs. Reflecting on my own experience of teaching within IT, I believe many ILOs in a course limits our flexibility when teaching: "I have to make sure all the ILOs are covered". This could explain why I find it difficult to implement problem-based learning. In a PBL setting, I find it harder du make sure that the students are doing "what they are supposed to do" to cover all ILOs. In relation to my own research on what the industry is looking for (Lauvås and Raaen 2017, 2021), *exactly* what the candidates know or can do is less important than communication skills, willingness to learn and the ability to cooperate with others. This is something I will have in mind when revising programs and courses in the future.

A nice addition to my previous knowledge and view on feedback is the contributions by Boud [5], Nicol [6] and Jonsson [7]. A common teaching practice so far (in my faculty and in many of my courses) has followed a traditional pattern of some activity (lecture, student preparation or other) followed by assignments. For the assignments I have distributed a proposed solution. I have also put

emphasis into trying to explain the proposed solutions – in class, or by producing video content where I try to describe how I think when trying to solve the task at hand.

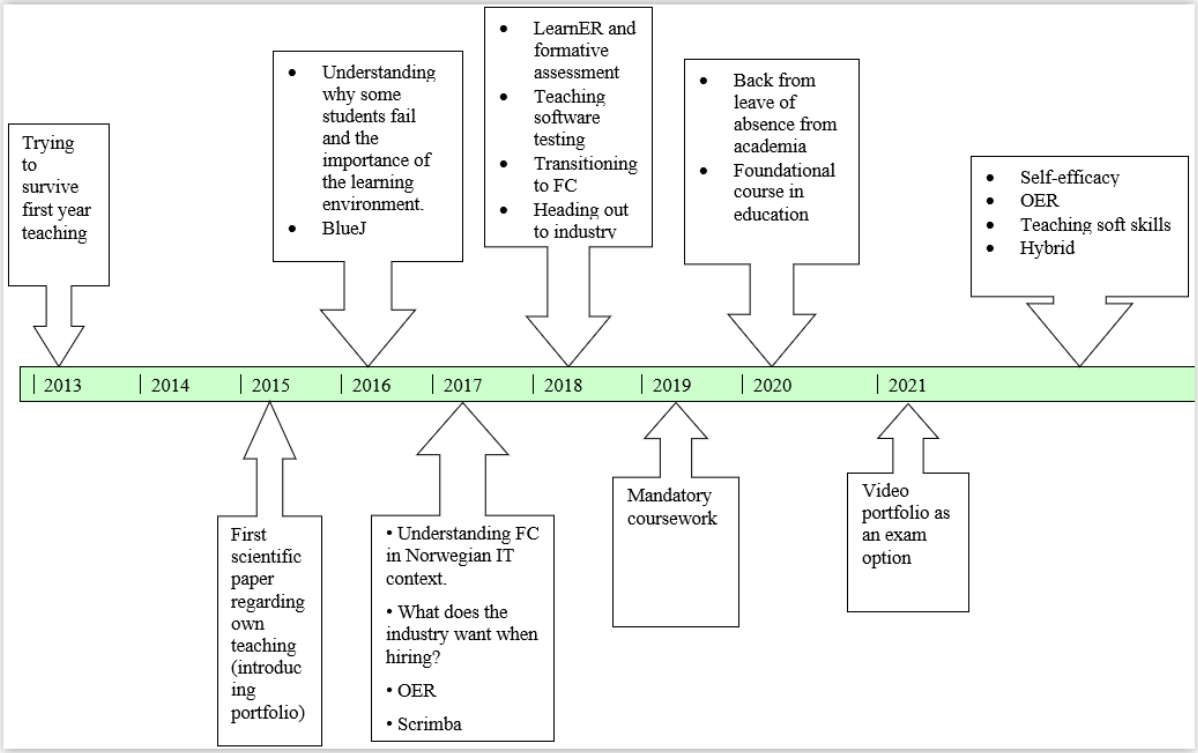
Looking back at this practice, the proposed solution might be interpreted as a form of feedback. As an educator, I may assume that the student will look at the proposed solution and use the learning resource for their own learning. If they did not manage to solve the assignment, they learn from watching me solve it. Or if their solution is different from mine, they might start discussing the difference with fellow students, TAs or me. It is possible to view this arrangement as feedback in a simplistic form.

In a broader feedback perspective, this form of feedback has multiple shortcomings:

- I do not really know how the students use my proposed solutions in their learning. I do know that they *request* the solutions, but I do not really know how they are using them to learn. And feedback has practically no value if the student does not use it (or know how to use it) to enhance their learning.
- A proposed teacher solution is not a direct feedback on student work. It is an implicit feedback *if* the student compares the solution to their own work.
- It follows the view of feedback as being a unidirectional transmission process from a teacher to a student.
- It follows a view that a student is relying on a teacher to adjust their learning, as opposed to being equipped with skills and knowledge on how to self-assess their learning according to a dedicated self-set goal.
- There is not feedback loop involved.

This does not mean that I will stop using proposed solutions in the future. In large classes where individual feedback is difficult, they can still serve a purpose. But when using them, I need to discuss with the students *how* the solutions may serve a purpose in a learning context, if used appropriately. And does the proposed solution have to be provided by myself? In a Flipped Classroom setting where learning materials are distributed early in the week and the eager students start early, I may just as well use student contributions as proposed solutions.

Looking back and looking ahead



Looking back at my interests and development within teaching, I see a mix of different elements. The most significant change has been the reduction of lecturing by introducing Flipped classroom. FC is, in my view, connected to constructive alignment. Lecturing is not an active learning activity and does not automatically align well with ILOs and assessment. At least that is my experience within IT subjects with a majority of ILOs involving functional knowledge and skills.

I believe I am heading in the right direction with an already established interest in research on teaching and a strengthened knowledge of pedagogical theory. I have several paths I want to pursue. Some of them are based on earlier work, and some are new:

- **Open Educational resources (OER).** I wrote a position paper on the topic several years ago (Lauvås, 2015), and I implemented some of the ideas in the database course where students published OERs as part of the portfolio. I plan on writing an SLR (if needed) on OER and try to influence my school on moving towards opening our learning resources. As an example, I have requested to openly publish all videos for an online database course in the making. It will be interesting to see how the school replies to that request.
- In our work on investigating **what the industry is looking for** in our IT candidates (Lauvås and Raaen 2017, 2021), we see that *soft skills* are important. Our next step is to investigate how soft skills are described in IT programs in Norway (analyzing program descriptions). Are they present, and if so; what skills? And finally, we plan on interviewing educators within Norwegian IT education regarding *how* they teach soft skills at their institution.
- How to incorporate **ILOs concerning learning and self-efficacy** in our first-year studies. I believe the work may benefit our students directly and indirectly. Directly if we manage to teach them important elements within learning. Indirectly as the faculty will learn more about learning in the process. The work on learning ILOs may go hand in hand with more collaborative student activities and connect to the research on soft skills in our education.

This topic has been in the back of my mind earlier but has grown bigger through the foundational course.

- **Hybrid course delivery**. I am about to develop my first digital course. I want to try to use learning content from the course as learning resources for the campus-based version of the same course. By doing so, I may offer campus students a choice between following the course in a flipped or traditional form.

Teaching and learning are complex phenomena. There will always be room for improvement, and there is no silver bullet for every given teaching context. And in the center of teaching is an educator with individual views on teaching and learning based on their own knowledge and experience. Today, we are questioning if the educator *really should be* the center of teaching. The focus is drifting over to the student and student-centered learning. The educator should take the role of the facilitator and facilitate the learning experience where the student actively can construct their own skills and knowledge from their individual standing. Add a collaborative environment where students may learn together and not rely on the educator for feedback and support, and we may be able to increase learning in a student population that has changed significantly in recent years.

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