

AN OPEN EDUCATION PLATFORM: LEARNING OUR WAY TO MIXING LIFE-LONG LEARNERS AND REGULAR STUDENTS

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ABSTRACT

In recent years we have developed an embryo of an open approach to education, where students, researchers and company liaisons take on a real challenge together, that the company partner needs to solve. These projects are part of the global Sugar Network on design thinking. Work conditions are realistic, and the initial brief contains a challenge, but no given solution to be developed, nor requirements to work towards. We have so far collaborated with varied organisations, including internationally well-known companies like Bosch, BASF, Tetra Pak and Barilla. We see great potential to further develop and scale this education embryo into a platform that will host a master's programme accepting a mix of newly graduated (bachelor) students and students with work experience who are there for a second stint of education. A master's programme would be designed for more long-term commitment to further education (1-2 years), where the project is the backbone of the education programme into which course content is added to support the process. Currently, as a prototype, we are running two Sugar Network projects in which employees from Saab participate in varied ways. Some Saab employees are in for the full eight months, some join only for the more theoretical book club, and some join separate workshops. In this way, we practice a learning by prototyping approach in line with what we teach. This paper presents both our thoughts on the overall master programme, as well as learnings from the past years and our more intense current set-up.

Keywords: Life-long learning, work integrated learning, professional education, prototyping

1 INTRODUCTION

Work Integrated Learning (WIL) has gained attention from universities worldwide as it has potential to elevate the employability of students [1]. Within professional fields, such as nursing, it is commonly used as a pedagogical approach to help students integrate theoretical and experiential knowledge [2], thereby putting into practice a view of learning as a knowledge acquisition process as well as a participation process [3, 4]. Previous research has explored various programme design and implementation models in WIL, including different delivery modes (e.g., internships, cooperative education, service learning) and examined their effectiveness in achieving learning outcomes. In this paper we will explore the development and implementation of an alternative form of WIL, where instead of university students going into practice, practitioners (in this case from Saab) come to university to participate in student project work, thereby creating a practice context for students within the university. In 2010, for the first time in 30 years, Saab began designing it's a new jetfighter from scratch; the Gripen E. It turned out to be challenging in unexpected ways [5-6]. A jetfighter is the kind of product that can no longer be understood and developed in its entirety by any single engineer. It is a complex system, and one that is integrated into layers of further complexity, such as combat systems, national politics, and international relations. It relies on the collaboration between many different disciplines both within and outside of engineering, that are located both within and outside of the company. Over the course of 30 years, the complex system and its organization tend to start mirroring one another and provide a source of stability. The upgrading and development of an existing complex system is very different from the creation of a new one. After 30 years, not only technology has changed, but also methods, employee education and competences, as well as the way of organizing. When the system is a white sheet of paper the design freedom is vast. The difficulties encountered during this transition (such as living with

uncomfortably high degrees of uncertainty and ambiguity, working towards frustratingly fuzzy, sometimes contradictory, goals with undefined problems, and levels of complexity that can be paralyzing) opened up many informal discussions between representatives of Linköping University and Saab on how we educate engineers (and business students and others). The discussions resulted in an informal collaboration to re-think (further) education and to do so for both students who do not know the ways and employees who need to change their ways. In 2016, with financial support from Saab, we set up our first global design project within the SUGAR Network (a spin-off from Stanford's ME310) with a focus on teaching students Design Thinking in a challenge-based setting. This 15 ECTS challenge-based course has since grown into a 30 ECTS (8 month) programme and another three 7.5 ECTS courses (Design Thinking Basics, Strategic Foresight, and From Early Tech To Design Brief) for master's students have been added. Work conditions are realistic, and the initial brief contains a challenge, but no given solution to be developed, nor requirements to work towards. We have so far collaborated with varied organisations, including large, internationally well-known companies like Bosch, BASF, Tetra Pak and Barilla, but also organizations such as Digital Film Tree (USA), LHC Dam (Linköping women's ice hockey team), Montessori School Trilobiten (recently renamed Montessori Mondial) and Östgötasvamp, a local mushroom grower. Each kind of participant comes to the challenge with a different purpose, but they all work towards one common goal: to present an innovative proof-of-concept prototype solution to the challenge by the end of the project. For student participants, the project is part of a course in the final year of their studies and works as a transition towards working life. They get to collaborate with students of other disciplines and from other global universities and hone their virtual collaboration skills and create something real. They also get to collaborate, and co-create, with industry experts. For company liaisons, the project represents an opportunity to learn new methods, new ways of thinking, a chance of future-proofing development work by collaborating with students and researchers from around the world, but also a way to get new insights into what they are already developing. In this way, the set-up goes beyond involving companies in a client role, which has been discussed at E&PDE before [7, 8], even in light of the learning that companies can gain from this [9, 10]. It also goes beyond separate continuous professional development. The only other E&PDE publication we found that aligns with our approach is [11].

2 AN OPEN EDUCATION PLATFORM

In 2021 we started turning our course into a new kind of education programme that provides a Work Integrated Learning experience for students while also providing opportunity for life-long learning for practitioners. We referred to it as an Open Education Platform (OEP). On a Swedish national level, 'Teknikföretagen' had then declared that in order for the Swedish technical industries to survive the rapid transitions that are going on right now in areas such as AI and automation, we need new models for education where what students learn is more relevant for their later employment and where the possibility to re-learn, change direction and build competence throughout a professional life is better supported. The Swedish ministry of Education had then posted their action plan to make higher education more accessible and life-long learning more possible with financial support for individuals choosing to pursue education later in their careers. Up until then, most of our regular specialization courses that might be interesting for practitioners were tied to admission to full study programmes, which would tie up too much time for a practitioner to be feasible to attend. In our OEP the Regular Students take part in a 30 ECTS challenge-based course where missions drive both learning and projects. They work in interdisciplinary and internationally distributed teams to take their challenge from white paper to proof-of-concept solution. Teaching modules are delivered on a just-in-time basis. Workshops on for example user interviews and observation methods are hence given when students start doing user research in their projects. For Practitioners we offer the programme as a smorgasbord of bigger and smaller commitments ranging from shadowing the 8-month process to participating in a 3h workshop. There is also the role of Liaison for the companies that provide the challenges, where the practitioner meets with the student team on a regular basis for coaching but also follow-up on progress made. Some practitioners will also come to the programme to teach a unit as part of their competence development. This has been done in the form of a Master Class where the practitioner introduces for example a tool that the students then get to practice together with the practitioner. This is based on the principle that by teaching someone else you start thinking about what you actually do, how, and why, which can lead to insights for the practitioner-as-teacher as well.

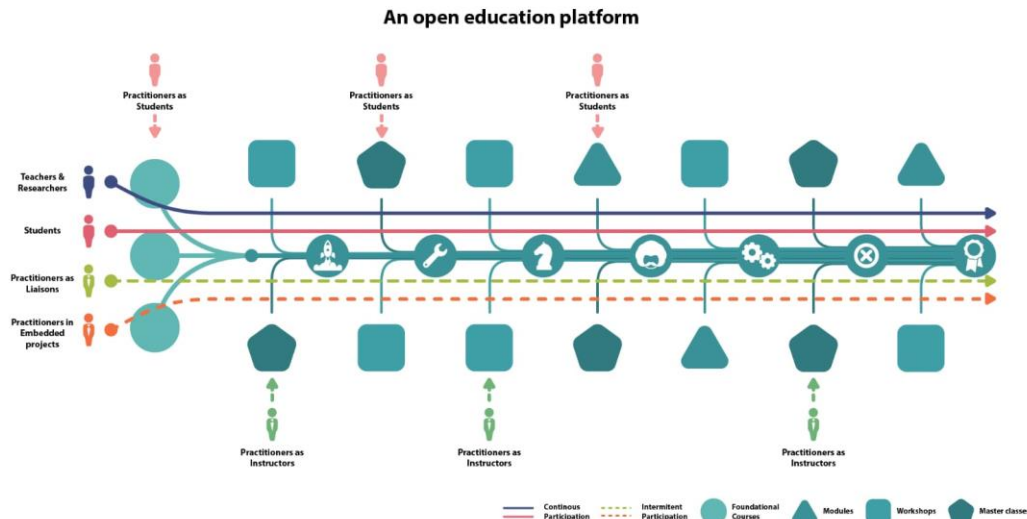


Figure 1. The model of an open education platform with multiple ways for industry partners to participate

3 THE FIRST COURSE PROTOTYPE 2022/2023

After the initial start with Saab in 2016, and after having worked with a score of other organizations, in the academic year 2022/2023 we picked up the collaboration with Saab again. Not by having Saab as the corporate sponsor, but by engaging experienced Saab employees in our Open Education Platform. The development of the platform is funded by Vinnova, with Saab putting their employees' time in as match funding. We have prototyped this open educational platform around two international student projects in teams of seven to eight, where half the team is located at another university. In total we had seven regular students in our Studio. In this first round we created four different participation modes for the seven Saab employees to see what would bring value. One person followed the programme as a theoretical exercise, taking part in book clubs (we read and discuss instead of giving lectures), one person did it as a practical exercise and took part in workshops only, two persons participated in book clubs and workshops, two persons did the full package as shadow members of our student teams. They also participate in some feedback sessions and made small contributions towards their team's project work.

3.1 Projects

Both our projects were with the same partner university and were funded through an EU initiative where researchers with early-stage technology are connected to courses and students whose role it is to find uses for the technology that has a positive impact on our world. We here set up a 'relay race' where Strategy Master students in a five-week course, using Christensen's Jobs-to-be-done framework [12], would identify markets, uses and users for the technology, and do initial user research, culminating in a design brief. This design brief was then further developed by the Teaching Team before it was handed over to the international project students in the form of a challenge. One project hence went from optical meta-surfaces as a technology to a "Digitalization of the Beehive" challenge for the eight-month project, done in collaboration with the local Beekeepers' Society and the technology owner. The regular student teams consisted, on each side, of three and four students respectively. Our local students had either engineering or business backgrounds whereas the international team as a whole also had design students.

3.2 Book club

In our education, we strive for a dual challenge. We challenge students to build prototypes and learn by doing (which is typical for Design Thinking), but we also challenge students to develop a theoretical understanding of what they do and a language that makes it possible to reason and discuss practice. Instead of lecturing we have chosen a weekly Book Club setup where we read foundational works and then meet up to discuss. The chosen literature covers three levels of abstraction where the lowest one mainly categorizes and 'talks about' different tools and how things are done (Storytelling, Journey Maps etc) in practice [12, 13, 14]. The next level of literature [15] adds theoretical connections and a common language that we can use to explain why we do things the way we do. It also connects to stories from

practice. The final level of literature [16] aims to give our students concepts and underlying mechanisms also on a more abstract level (and therefore applicable in multiple contexts of practice) and helps us understand design and problem-solving and put contingencies around design methods taught so that students also can discuss and change methods as they face new types of situations. We read a chapter or two per week and meet for two-hour sessions. We start out discussing in small mixed groups first to together figure out what the author was trying to say and also how that relates to what we do in our projects. We then move on to a moderated full group discussion to share impressions and draw conclusions.

3.3 Workshops

Workshops are more hands-on oriented, half days or full days, with a mix of brief backgrounds and introductory mini lectures followed by practice, feedback and drawing out learnings. We start with a 24h simple design challenge where students get to experience a full, but quick and shallow, iteration of Design Thinking. Other workshops focus on topics like User Research Methods, Synthesis, Low Fidelity Prototyping Methods, or Tinkering Systems (Prototyping), timed and tuned towards the needs of the projects. The Low Fidelity Prototyping workshop for example included an exploration (by doing) of different media for idea representation, contrasting starting with clay versus starting with a collection of technical components (see Fig 2a&b). The Tinkering Systems workshop used (board)game design as a way to design and tweak systems in quick iteration (see Fig 2c&d).



Figure 2. The prototyping workshop included an exploration of different media for idea representation, contrasting starting with clay versus a collection of technical components (a & b) The tinkering systems workshop used (board)game design as a way to design and tweak systems in quick iteration (c & d)

4 EXPERIENCES

We are currently at the end of our prototype-year. So far, we have held several feedback sessions with the industry participants, as well as informal reflections, to see what works, and what needs to be improved. This feedback both covers the content of the platform as well as the formats in which it is delivered. Within the Saab organization there is a so-called champion. A manager strongly behind this set-up that both pushes employees to participate as well as pushes the business organisation to enable it. This manager is not necessarily the line-manager of all the employees participating. All actual line-managers of participants therefore all had to be okay with the initiative as well. Informal feedback from the Saab project partner indicates that both the book club and the separate workshops are actively being discussed when participants return to the workplace, creating a bit of a buzz. Employees feel triggered to reflect on how to translate insights from modules and workshops into their industrial practice and discuss those with colleagues who did not attend. Their engagement with new theory (at least to them) and knowledge brings inspiration. A practical example of this is their realization that prototyping could and should be much earlier in the development processes. “Currently, we usually spend only 10 second in the problem field, and years in the solution field. We build too high fidelity too late in the process for maximized learning. It would be better to stay in the problem field much longer.” (See also [14]). From the two employees who are involved most thoroughly, we hear that it is also interesting to follow the student projects. Not so much for their content, but to try to take a helicopter view, zooming out from their particular problems to more generic patterns. And then to understand those challenges in a more generic way and link them to the theory from the book club. It helps to fully comprehend the day-to-day

development processes they are in in their industrial life. On a more practical, logistics level, aligning with the academic schedule goes well enough if schedules are available in time. Most challenging for industrial participants is to find the time to read the material for the book club (usually in the evenings). Book clubs are run within Saab as well, but those are paced adapted to working life. Our book club is adapted to student life, so the reading pace is much higher. Industrial participants of workshops feel out of their depth sometimes, missing the grounding in theory that the book club readers do have. Here, providing some summary material would be helpful. From a social cohesion point of view the mixing of students and professionals goes well. "I thought we would have experienced the difference of age much more than we actually have." From the student side, the participation of industry professionals has been a true enrichment, through the added professional experiences and reflections. From a teaching point of view, running a book club as well as workshops that are perceived as relevant by professionals from industry as well as by students requires more than ordinary teaching. As a teaching team you are not automatically the most knowledgeable about all aspects of the course. Being able to deal with the associated uncertainty does require a certain level of maturity and experience, to dare to let sessions go in which ever direction turns out to be most intriguing. One thing that helps here is to have people – both teaching team members and participants – who can tap into 'a library of weird stuff', a wide array of interesting examples from a range of fields in which they can spot and help others see relevant connections. During the book club, having people with industry experience participate helps provide examples from practice to both digest and reflect on the proposed notions. Having the industry perspective helps students see the relevance. At the same time, for the Saab employees it brings new ideas. The resulting mix of fresh ideas with a reality check makes the discussion sessions fruitful. One of the corporate participants in the book club is also pursuing a PhD degree, as an industrial PhD candidate (a Swedish phenomenon where employees in external organisations, such as industry or (semi)governmental organisations pursue a PhD anchored in their daily work, and within their regular contract hours). He will likely also credit the book club as a reading course as part of his doctoral education.

5 LEARNINGS AND WAY FORWARD

What our Open Education Platform does in essence is that it creates a practice context at the university that simulates the future workplaces of many of our engineering and business students in a rather realistic way. This means that a community of practice-like [17] participation learning opportunity is created. Learning from experience only can however be a slow process, and also one that does not always teach the right lessons [18]. In the delivery type of learning on the other hand, knowledge has been externalized and abstracted into lessons that can more easily and purposefully be communicated in books and lectures. Learning from Book Clubs here provided more efficient delivery type of learning. For an inexperienced person, such lessons may seem rather dry, but for a person whose head is already full of experience, such lessons can provide a way to make sense of that experience. This is also one of the synergy effects we can see in mixing experienced and not very experienced students, and one that was to be expected. The synergy effect we did not expect however, was the way the practitioners' intermittent participation in the students' project work would elevate the practitioners' learning process. They were in a way able to live the experience vicariously, thereby helping them see what something that had been described in words in their articles might look like in practice without having to spend full time in the practice. Seeing the students' failures and successes also helped practitioners to better understand what they can expect from newly graduated students and how they can put them to better use as well as better support them. The next step to further build on this will therefore be to have a Saab provided challenge, which would be closer to the practitioners' normal context and the kind of work in which they will implement their learnings.

The current version of our project course stands at 30 ECTS points over an eight-month period. We see great potential to further develop and scale this education embryo into a platform that will host a master's programme that accepts a mix of more newly graduated (bachelor) students and students with work experience who are there for a second stint of education. A master's programme would be designed for those ready for a more long-term commitment to further education (1-2 years), where the project is the backbone of the education programme into which course content is added to support the process. In evolving the current course into a master's programme of either 1 or 2 years, both the project itself might be scaled, as well as other courses, international exchanges and a thesis would be added. However, components of the programme, such as Foundational Content Courses (weeks), Workshops (days), and

Modules (hours) will be open for practitioners to participate together with students. In addition, there would also be the possibility for companies to have employees participate in the project as liaisons. This would support lifelong learning and create opportunities for more short-term education commitment and stronger integration between education content and company work assignments, as well as better prepare students-about-to-graduate for work life expectations. In conclusion, through this prototype of an open educational platform, we are learning our way towards mixing life-long learners and regular students in a way that is perceived as highly rewarding by the students, by the industrial participants and by the teaching team as well (which also aligns with the findings by Van Boeijen in a similar mix of practitioners with regular students [10]). Scaling small-scale initiatives to a fully fledged master's programme, will require buy-in from both additional industrial partners, as well as Linköping University. We are also in the process of securing the required funding for development from either external and/or internal sources.

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