



# Excited

Centre for Excellent IT Education

# 2019

ANNUAL REPORT





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We hope you find  
something in this report  
that makes you





Guttorm Sindre

## ● Greeting from ● Centre Leader

**Dear reader,** It is with great pleasure that the Excited Centre for Excellent IT Education presents its annual report for 2019. Both at NTNU and Nord University the activity level has been high, with many events, workshops, summer schools and publications. Our results were made possible by the efforts of a wide range of people. The leaders of our five projects have worked with Excited amidst other teaching and research tasks. Our PhD-candidates make our team young and energetic and enable us to pursue follow-up research on teaching and learning activities and interventions.

**Without our** administrative coordinator, our Centre might have been too chaotic to be productive. Our part-time student assistants have brought a valuable student perspective into our work and have been vital in helping both with learning interventions and research tasks. Both our Steering Committee and our International Advisory Board have engaged in fruitful discussions with us about results and plans.

**Contributions to Excited** have come from many more than those who are directly on our salary list. Collaboration with the departments where we are embedded has been excellent. Numerous university teachers and administrative personnel outside the core team have given input to our activities in various ways, for instance through seed funded projects for educational improvement. Leaders on all levels have shown great commitment to the success of Excited.

**Every university department** is committed towards improving education quality, whether having an SFU or not. However, the centre status has enabled us to hire more people and thus pursue educational improvement in greater breadth and depth than what would otherwise have been possible. Being part of the SFU community through NOKUT and DIKU has given us an extra strength and confidence in our work.

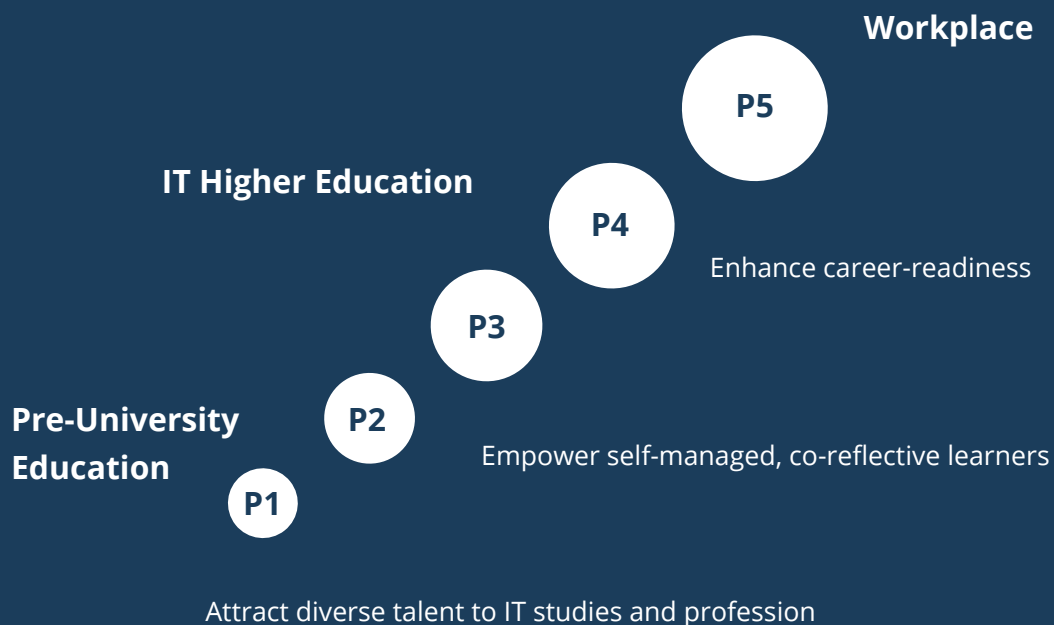
**Through the first three years,** having an SFU has gradually changed the culture of our departments, towards more discussion of teaching and learning quality, and more focus on didactic competence in hiring processes.

**2020 will be a particularly exciting** year for Excited as we are up for our midterm evaluation. We see this as an excellent occasion for evaluating our progress, and for engaging in constructive discussions both internally and with the evaluation committee on how Excited's activities and impact can be further improved. The projects are all moving ahead at full speed in 2020, and we are looking forward to every discussion, conference and event.

# ● ● ● Our Vision

**:To put Norway in the forefront of INNOVATIVE IT EDUCATION and make IT an increasingly more ATTRACTIVE STUDY choice for young people**

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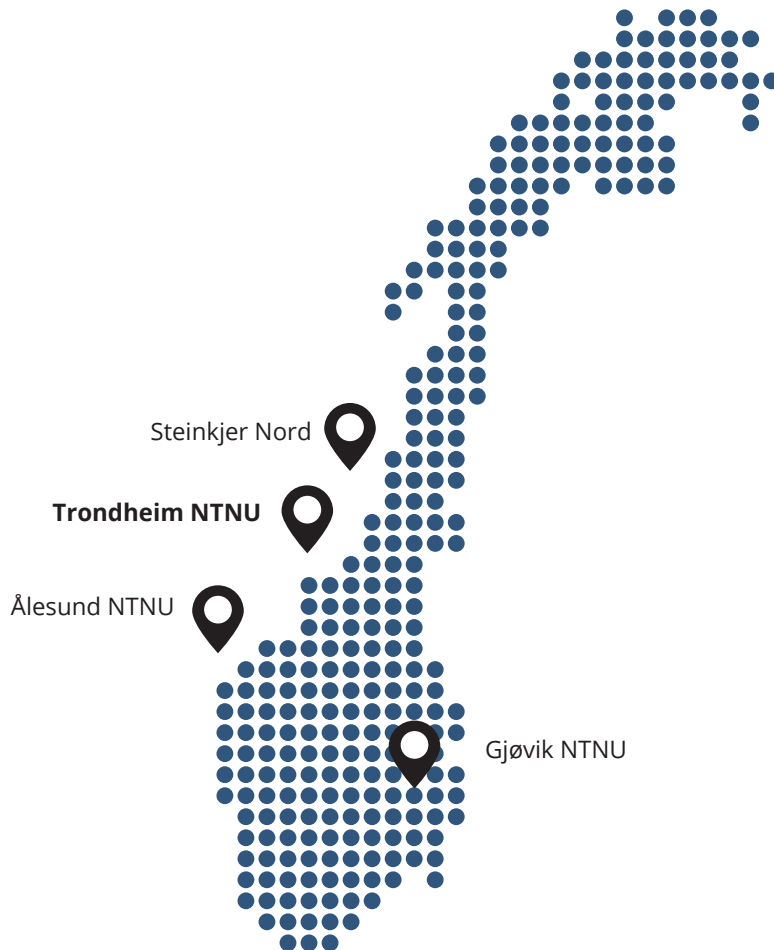
———— **IT Studies at the Bachelor and Master Level** ————>

# ● ● ● Objectives

- 
- 1** Enhance the learning in our study programs through increased student engagement and cross-campus collaboration and co-reflection among students and staff.
  - 2** Enhance motivation and career-readiness of the candidates by increased collaboration with potential employers in the design, delivery and quality assurance of the education.
  - 3** Attract diverse talent to IT studies and profession by motivating for and improving the knowledge of IT and its possible career paths among Norway's pre-university youth.

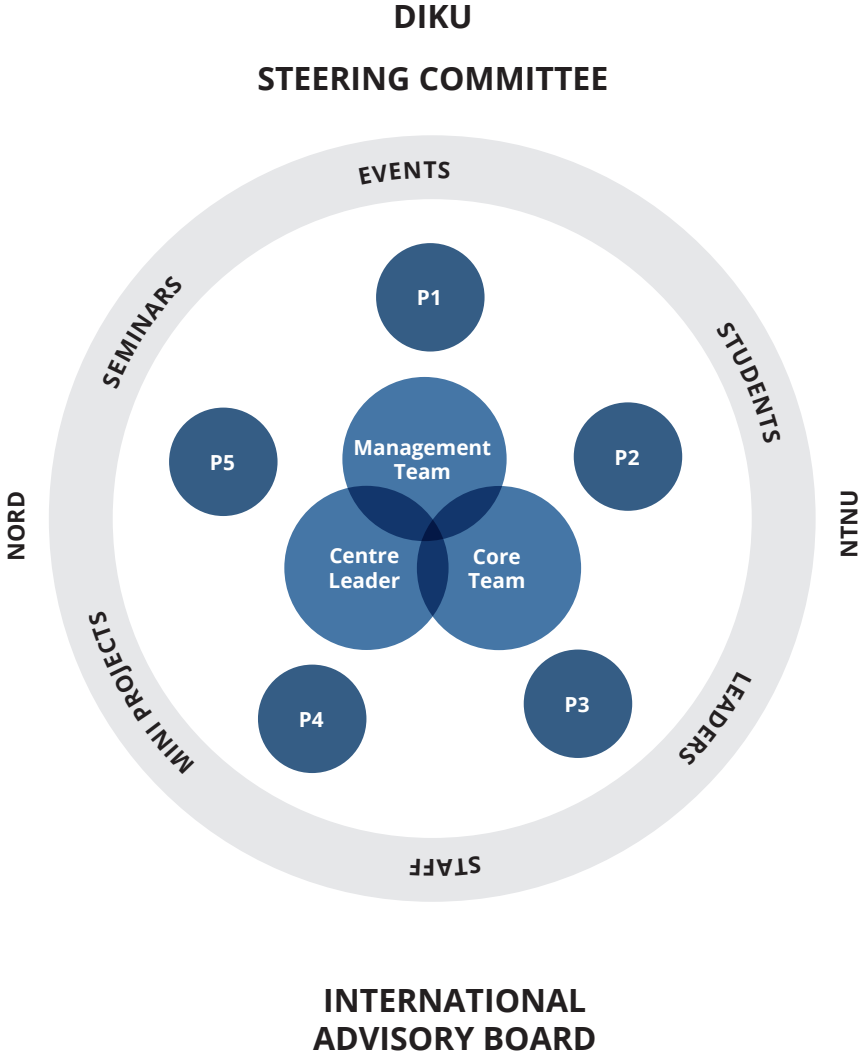
## ● ● ● About Excited

Excited is an acronym for Excellent IT Education, and the focus is primarily on education in IT, not by means of IT, though the former does not exclude the latter. Excited is a partnership between NTNU and Nord University. Our headquarters are hosted at the Department of Computer Science (IDI) in Trondheim, but the NTNU part of the activity also involves the campus at Gjøvik, and the campus at Ålesund (Department of ICT and Natural Sciences). Our activities at Nord University are mainly focused on two study programs at the Steinkjer campus.





# Organization Map



# ● ● ● Research Organization

## Centre Leadership and Management Team

The Centre Leader, the Administrative Coordinator and Vice Leader form the core operations team of Excited, having weekly planning meetings. The Management Team further includes the project leaders of the five projects P1-P5, as well as a representative from the Ålesund campus. The extended management team have weekly meetings on Skype as it spans four different campuses in addition to dedicated seminars.

## Steering Comitty

Our Steering Committee has posed interesting questions and made sure we report in an accountable way.

## Advisory Board

The centre's international Advisory Board are all prominent scholars within the field of IT Education.

The Advisory Board has given valuable feedback on results and plans both for the centre as a whole and for each of the five projects, mainly through annual meetings sometimes face-to-face, sometimes Skype plus email interaction.

## Cooperation with our Host Organisations

Excited has a close collaboration with its host institutions NTNU and Nord, especially on the local department level. Several academic and administrative employees have been involved in Excited-related tasks without having been on Excited's payroll, and Excited has been a major contributor in seminars discussing educational improvement, especially on the department level. The Excited leader has a seat both in the Educational Board and the Extended Management Board of the IDI/NTNU department, and Excited has been a major force in inspiring the department to open more positions with an explicit educational / didactic focus. Some Excited members have also been involved in committees on the central level, such as the P4 leader being involved in the project "Interactive learning spaces", and the PhD candidate of P2 being involved in the project "Future tech studies". The project leaders have been part-time on Excited and otherwise doing their normal professor tasks, typically with a 30/70 distribution. The Excited work is related to educational improvement and corresponding follow-up research and dissemination, while the non-Excited part of the job deals with the normal operation of educational offerings and any research and administration the professor may have outside of Excited (e.g., involvement

in other projects). Often, it may be difficult to say exactly where the Excited job ends and the rest begins, as the two are closely intertwined – for instance, the quest for improved course designs and the day-to-day interaction with students in current teaching will clearly inform each other in the professor's mind, and the leader of P1 is at the same time involved in an EU project which has clear synergy with Excited.

## PhD Candidates

Excited has 7 PhD candidates, one associated with each of the projects P1, P2, P4, and two with each of the projects P3, P5. The PhD candidates were recruited at various times (2017 2018, 2019), partly due to challenges with filling the positions I the centre's first year. The PhD candidates are doing much of the action research and follow-up research on the educational interventions that Excited is pursuing.

## Master Students

A number of master thesis projects have been conducted in connection with Excited, typically with an Excited project leader or centre leader as main supervisor, and sometimes, PhD candidates have been involved in the supervision too. In 2019 alone there has been 20 projects. Some of the master works have resulted in papers presented in peer-reviewed national or international conferences, or national academic dissemination events.

## Student Assistants

Every year, Excited has employed about 20 students in part-time jobs throughout the study year, divided on all four campuses. These student assistants partly help with running learning interventions piloted by Excited, and partly with the centre's research. To some extent they do work related to the centre as a whole, organized through the Administrative Coordinator, and to some extent they make contributions to specific projects. Several of them have participated in national conferences to present work they have done in Excited. We have also employed some students for summer jobs, for instance doing exploratory work with e-learning tools and digital learning resources.

**Student reference groups** are comprised of students who are not on Excited's payroll, for instance class representatives, and members of student associations. We had several meetings with such reference groups

especially during the first two years of centre operation, discussing directions for the center. Some such meetings had participation from the Core Ops Team, and some were organized by Student Assistants. These meetings provided valuable student feedback on Excited plans.

### **Mini-project Participants**

Excited has run several rounds of seed funding for initiatives to improve course quality or the learning environment. Mainly, the applicants have been teachers wanting to try new approaches in the course they are teaching, but there have also been projects initiated by students or administrative employees. Decisions on whether to grant various application for mini-project funding have been taken by the Management Team, and most of the mini-projects have been in the scope of one of the larger projects P1-P2, or sometimes cutting across aspects of two or three projects. Grants typically involve some money, for instance for hiring extra assistance or buying the teacher free from other tasks to have time for designing and piloting a learning intervention. In some cases, Excited student assistants could be allocated to the mini-project tasks so that no extraordinary hiring was needed. Upon finishing a mini-project, the applicant sends a report to the Administrative Coordinator.

# Personnel

## Senior staff

Guttorm Sindre, NTNU, Trondheim (Center leader)  
Monica Divitini, NTNU, Trondheim (P1)  
Hallvard Trætteberg, NTNU, Trondheim (P2)  
Line Kolås, Nord (P3)  
Rune Hjelsvold, NTNU, Gjøvik (P4)  
Birgit Rognebakke Krogstie, NTNU, Trondheim (P5)  
Ida Sortland, NTNU, Trondheim (Adm Coord center)  
Ottar Osen, NTNU Ålesund  
Robin Isfold Munkvold, Nord (Adm Coord Nord)  
Helga Dis Isfold Sigurtdardottir (Nord)  
Trond Olav Skevik (Nord)  
Steven Thomas Ford (Nord)

## PhD Candidates

Gunhild Marie Lundberg  
Hege Anette Olstad  
Justyna Szykiewicz  
Abdullah Bahmani  
Madeleine Lorås  
Vojislav Vujošević  
Fredrik Weisethaunet

## Steering Committee

**Head; Berit Kjeldstad**  
Vice Rector for Education NTNU  
**Hanne Thomassen**, Dean of the Social Sciences  
faculty at Nord University  
**Roger Midtstraum**, Vice Dean of Education,  
Faculty of Information Technology and Electrical  
Engineering, NTNU  
**Geir Ove Rosvold**, Study Program leader at the  
Dept of Computer Science, NTNU  
**Camilla Wadseth**, industry representative, Kantega  
**Miriam Lillebo**, student representative, NTNU  
**Dag Bjørnar Hollund**, student representative, Nord

## Advisory Board

Arnold Pears KTH, Sweden  
Ole S. Iversen Aarhus Univ., Denmark  
Peter Hubwieser TU Munich, Germany  
Barbara Erickson U. Michigan, US  
Mark Guzdial U. Michigan, US

## Student Assistants Excited 2019

Hanne Brynildsrud, NTNU  
Hanne Olsen, NTNU  
Markus Malum Kim, NTNU  
Marius C. Sjøberg, NTNU  
Aksel Østmoe, NTNU  
Magnus Strand, NTNU  
Regine Ruud, NTNU  
Alis Wiken Wilson, NTNU  
Håvard Løkensgard, NTNU  
Bendik Deraas, NTNU  
Jenny Almestad, NTNU  
Marit Fredrikke Hansen, NTNU  
Rose Lu, NTNU  
Anne Margrethe Bosch, NTNU  
Sigurd Strand, NTNU  
Simon Kvannli, NTNU  
Sondre Wold, NTNU  
Joachim Jørgensen, NTNU  
Magnus Eide Schjølberg, NTNU  
Kasper Aalberg Røstvold, NTNU  
Andreas Aursand, NTNU  
Karoline Bernklev, NTNU  
Jonas Bratli Grannes, NORD  
Astradur Isak Larusson, NORD  
Trym Rannem, NORD  
Erlend Brodal, NORD  
Bjørn Vidar Dahle, NORD  
Yu-Ting Chuang, NORD  
Kine Olsen, NORD  
Jonas Larsen, NORD  
Hlib Danilov, NORD  
Hildur Horn Sigurtdardottir, NORD

## ● ● ● The Coordinators

**To really become a center, all the different activities must be coordinated, and you have to make sure all the right people are talking together and are in the know of what is happening. Excited has two coordinators. Their job description is to help the center leader make a center out of all the research projects, activities, and people involved in Excited.**



Robin Isfold  
Munkvold

Robin is an associate professor in Computer Science. He is the coordinator at Nord and does a lot of follow-up with both colleagues and students on Excited-related projects, supporting the planning and helping out on practical issues on the different projects. In addition, he does active research of his own as part of this, trying out new educational approaches.

He coordinates research-collaboration across Nord and NTNU, and with local schools. Robin has been involved in initiating the P1, girls and tech related projects at NORD, plus the startup of the yearly games development summer school for kids, in Steinkjer. Related to P2, Robin has initiated the Excited Workshops, similar to the NTNU "IDI Study Day". In addition, Robin has been involved in research and publication on different perspectives related to P3 - Learning through construction, as well as initiating a cross-University project looking into Student peer evaluation in project courses. He has also started up a network with other Norwegian Game development educators, seeking to enhance the quality of such educations.



Ida Sortland

Ida has an MSc degree in pedagogy and supports the management group in putting ideas to action. She is also the link between the center and the administration at NTNU and Nord. She is the manager of the student assistant team and plans and supports Excited events and seminars.

A big part of the job is to work with the center leader to make sure that the outside world as well as everyone in the management team and the PhD candidates know about all the activities, projects and research going on under the Excited umbrella, so that we all pull in the same direction and build on each other's results when we can. A lot of time is spent as a center "janitor", trying to make everything run smoothly, and taking care of budgeting and accounting.

## Summary of Results so Far

**Excited has had a wide range of activities so far, spanning all the involved campuses, producing a multitude of results. This section can only give a brief synthesis, here organized by stakeholder groups rather than the five projects P1-P5 by which Excited is structured.**

Different activities organised by Excited for secondary school students led to the development of useful expertise and knowledge about teaching IT to pre-university students, increasing their awareness of IT, and making IT more motivating. These activities also led to the development of new learning resources that have been developed and piloted in and outside schools, with participants from the relevant age group. Some of these resources are at the prototype level, as for example a serious game to increase awareness of privacy issues in the modern digital world. The Excited summer schools held in Nord / Steinkjer, both in 2018 and 2019, resulted in a format that could be replicated in other contexts. Cooperation with external actors has also allowed the development of resources widely available for adoption. For example, cooperation with the Bebras project has contributed to the translation into Norwegian of Bebras' learning resources for understanding computational thinking. Excited has funded summer job students to improve LKK's web pages and collection of learning material, a shared resource for all LKK's coding clubs across Norway (currently 186 clubs), widely used as well by teachers in primary and secondary schools.

For teachers in secondary schools, Excited incited the CS department at NTNU to offer two new continuing education courses on the topic "Programming for teachers", and have contributed with follow-up research to enable these courses to flexibly support a variety of competence needs that the school teachers may have. Excited also hosted LKK's Teacher Conference in Trondheim in 2019, gathering around 100 programming teachers for inspiration and exchange of experiences. A similar event is planned for 2020. Excited has also become involved in the program board for the study program Natural Science with Teacher Education (for students typically targeting careers as teachers in upper secondary school), to contribute to improving the social and academic learning environment and increase the throughput of candidates with informatics specialization from this degree program. At Nord university, L. Kolås is invited to teach in the "Teacher specialist program in professional digital competence" in 2019-21 at the Teacher Training department.

To make impact on lower education decision-makers on the national level, Monica Divitini (project leader of Excited P1) has been involved in a committee for revising the computing curriculum of high schools in Norway, working on the elective course in programming. For international influence, Excited is the Norwegian member of the European Organization All Digital.

For university students in IT, Excited has been piloting a number of learning interventions locally at various campuses, in various study programs and courses within the scope of Excited. One example is "IDI Study Day" which targets first-year students, providing a learning (and social) arena where students come together and get help from TA's across all the four courses they have in the same semester. The intervention started out as a pilot in one study program in Trondheim in 2017, then two in 2018, and a similar effort was also established in the Gjøvik campus NTNU, and at Nord University in Steinkjer through "Excited workshops" for students. It has now moved from pilot to ordinary operation by the department. A similar pilot to ordinary operation story is the "lunch buddy" scheme, a collaboration between Excited and the IDI department administration, which won NTNU's Buddy Price for 2019. The aim is to help lonesome students make more acquaintances, by arranging sponsored lunch meetings between pairs of students who do not know each other from before. Another contribution is towards improved pedagogical competence of Teaching Assistants, where Excited developed an improved disciplinary specific module to the compulsory Ped course "LAOS" that TA's must take. Excited has made research findings on the student perspective on courses with "Learning through Construction" (LtC, for instance, project-based learning), on cross-campus teaching, how students perceive their own employability, and the extent to which students are able to acquire relevant summer jobs during their studies. We have piloted the usage of student e-portfolios, by which students can reflect on their competence as it develops during their studies. On the national level, Excited has supported FIF - an umbrella organization where the student social organizations of various IT study programs in Norway gather to exchange

experiences. The two main student social associations Abakus and Online at the NTNU Gløshaugen campus in Trondheim are very well run, as the students themselves organize a lot of how-to-courses, meetings and seminars with work-life representatives, announcement of relevant summer jobs, etc. – and have a lot of useful knowledge that can be transferred to student social associations from other campuses.

For university teachers, Excited has provided seed funding by means of so-called “mini projects”, where teachers could apply for money to improve the teaching in their courses, e.g. to try out new learning interventions. One example of such an intervention is to have students write parts of their own compendium. In addition to the main goal of improving student learning, the pedagogical development work and subsequent reports and publications about it (several teachers have e.g. made peer-reviewed conference papers about their mini-projects) can also be useful for the teacher in case of applying for promotion or for the title of “merited educator”. P4 project leader Rune Hjelsvold achieved such status in 2018, with work related to Excited as one of the important pillars of his application. Concerning Learning through Construction (LtC), we have made investigations relating to the teacher perspective on LtC, such as their perceived needs for learning spaces, IT tool usage in project courses, and how to succeed with forming effective student teams. A case study has been made with teachers of five different courses that were taught across two campuses, and a set of guidelines for how to prepare cross-campus teaching has been provided – with concrete advice to teachers in terms of do’s and don’ts. Excited has also contributed research insights and prototype tools related to e-assessment. On the national level, a community of practice has been established among faculty teaching game development in various higher education institutions in Norway. Within the CS department at NTNU, some coordinating groups have been organized within various topics (introductory programming, algorithms, databases) – these are not yet nationally open communities of practice but specific NTNU initiatives, though spanning all the three campuses (Gjøvik, Trondheim, Ålesund). Excited has also started a lunch seminar series at the CS department in Trondheim, also streaming to Gjøvik and Ålesund, to increase the focus on pedagogy in the discourse among staff. Excited has also started a lunch seminar series at the CS department in Trondheim, also streaming to Gjøvik and Ålesund, to increase the focus on pedagogy in the discourse among staff.

For study program leaders, Excited’s findings about employability and career-readiness for our IT students as seen from the viewpoint of employers and alumni can be interesting input for future design / redesign of study programs, and for re-accrediting existing programs. Excited has also made research about the relationships between the structure of degree programs and student satisfaction, and of correlation between student performance in various courses. Especially for LtC courses, the learning outcome descriptions have been analyzed to identify overlaps and progression. Excited is also involved in the project “Future Technology Studies” (via P2 PhD candidate Madeleine Lorås). This project is aiming to reshape both 3 year engineering study programs and 5 year integrated Master of Technology study programs at the NTNU, report to be delivered by the end of 2021.

For stakeholders in work-life, Excited at Nord University has made an investigation on the knowledge transfer between academia and work-life in creative parts of IT like games and media technology, and has contributed to setting up arenas where students and work-life representatives meet. The game development study program at Nord has achieved a very high score on Studiebarometeret on work-life connectivity (4.4 – average for IT studies is 3.4).

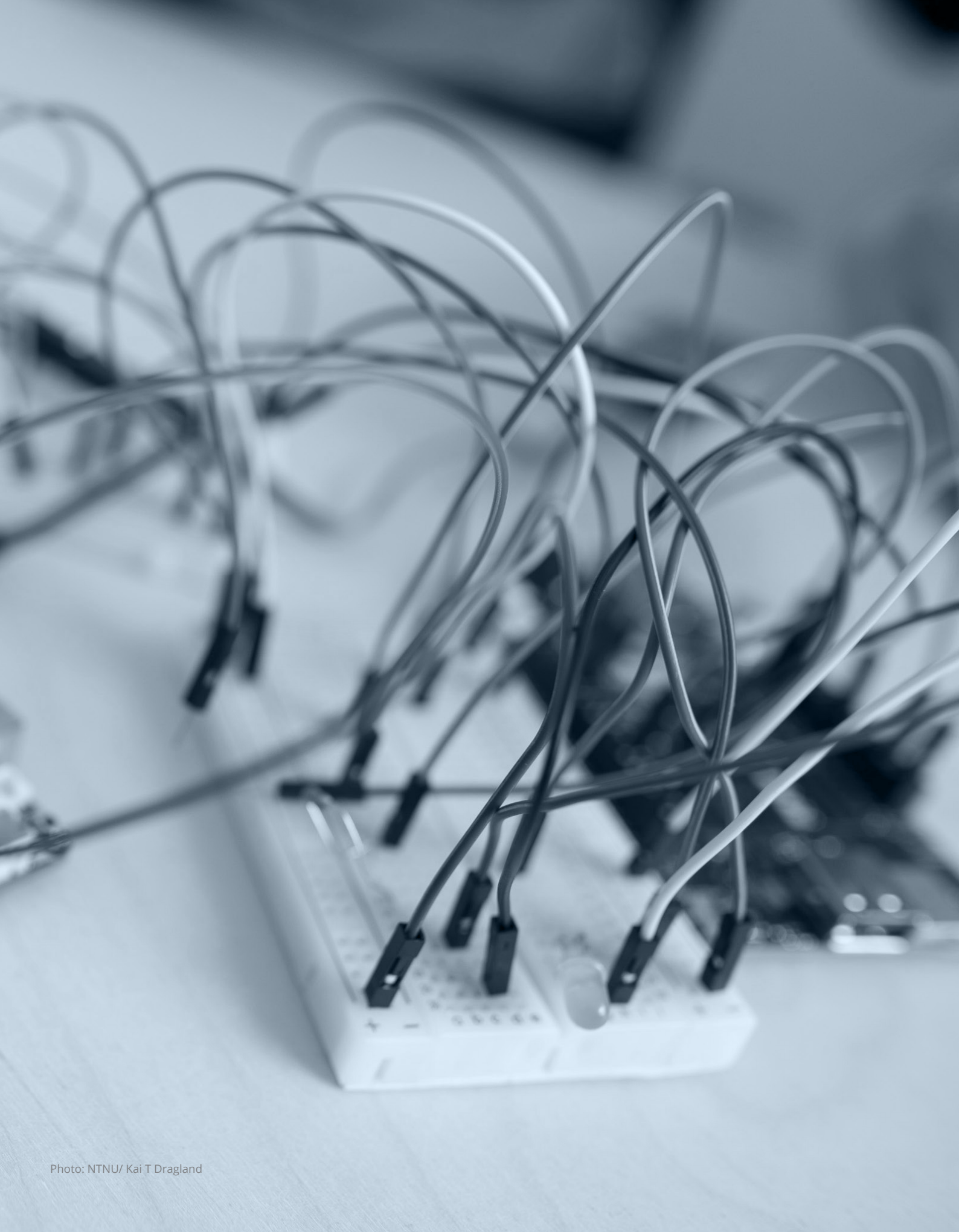
At the NTNU, we have investigated employer and alumni perspectives on employability and work-life competence needs for several study programs, and the findings from these studies are useful for future revisions of study programs and course content. It has also been investigated how industry representatives are brought in as guest lecturers, finding that it currently depends much on the personal networks of teachers, spurring ideas on how this can be improved.

For the research community within IT Education, Excited has published its findings in peer-reviewed conferences and journals. We have also been involved in organizing several conferences. On the national level, mainly UDIT (Education and Didactics in IT) where Excited has had the general chair plus several PC members the last couple of years, but also having PC members in MNT-konferansen and NKUL. On the international level, we organized the conferences FabLearn and IDC in Trondheim in 2018, I3E in 2019, and in 2020 we have been given the honour of hosting the ACM ITICSE conference in Trondheim.

*A total of 3500 students  
learn IT at the Excited  
campuses*









# MAIN PROJECTS

P1

**Informed Decisions** aims to increase the knowledge of IT and the IT profession for pre-university students in particular and help them consider an IT career on a more informed basis.

P2

**Projects of Becoming** aims to help our freshmen to accomplish two transitions, on the short term (1st year) from high school to university, and on the longer term (3-5 years) from novice to professional.

P3

**Learning through Construction** aims to maintain and further develop students' interest and excitement by creative design of IT artefacts. In our education, typical arenas for such learning is through project-based courses and makerspaces.

P4

**Sharing and Diversity** aims to develop highly efficient cross-campus learning spaces. With similar courses at several different campuses, shared development of learning resources among teachers should be encouraged. Students can have more courses to choose from (i.e. more diversity) by being able to follow courses from other campuses.

P5

**Career Readiness** aims to strengthen and expand the education-work connectivity by providing students' with "real-life industry-driven" learning. It aims both to enhance work-relevance of the study programs, and to better involve employers in the continuous renewal of the education.



Excited's stand at the national conference for ICT in education and learning in Norway. From left, Vojislav Vujošević and Anne Margrethe Boch. Photo: NTNU/ Kai T Dragland

# P1



Head of Project  
Monica Divitini

## Informed Decisions

**2019 has been a very exciting year for Informed decisions. This project aims to increase the knowledge of IT and the IT profession for preuniversity students in particular. We want to inform them so they are able to consider an IT career on a more informed basis. Both at NTNU and Nord University the activity level has been high, with many events, workshops, summer schools and publications on the research done on them.**

What I probably enjoyed most were the activities we organized in schools. We have received very positive feedbacks from both pupils and teachers. It is always interesting to see pupils take responsibility for their learning and being proud of their achievements. As one teacher said "This was an interesting experience for me and my students. We dealt with something practical, modern and with prospects for the future." Data that we collected during the activities shows that the activities provide satisfaction, enjoyment, and a good sense of performance. In the words of one pupil "...I feel lucky as other schools don't have these kind of courses..." Some pupils also change their attitude towards IT, as one student said "I understood that I must be more open to such activities and to have a different stance." This is very important especially for girls, who are often underrepresented in IT-related subjects.

*When we have workshops, the teachers are always very engaged and curious. I am impressed by their level of enthusiasm and professionalism. Teachers appreciate that we bring a new perspective into the classroom.*

In 2019, working with researchers across Europe has also brought value to this effort because it helped us to be more reflective regarding challenges that are common and others that are specific of national educational systems and cultures. We have a number of lessons learned that we are packaging to make them more easily available to teachers in schools. This year I was part of the committee revising the national curriculum in Norway, working with the elective course on programming. It helped me to put things in perspective and to gain a deep understanding of the complexity of the curriculum. Also, we are now in a better position to support teachers because we have gained a better understanding of the challenges that they will face, but also of the possibilities that will come with the new curriculum. The activities that we have promoted in these past years are fully in line with the basic values underlying the national curriculum. So, this gives us confidence going forward with the project.

## Highlights from 2019

- Students participation. University students have joined activities in the context of P1 with different roles. Some of them have helped with the activities in schools, others have completed master theses in the context of P1, developing prototypes that have been tried out in schools. Students take pride in sharing their knowledge and their passion with pupils and they are important role models. We observed again and again that they are always the first choice when pupils have to ask questions or are facing any challenge. Some students have also been able to publish their work in international conferences. This is a proof of the quality of their work and it is important to motivate others. Maybe some of them will join for a PhD!
- Cooperation network. In 2019 we start seeing the results of the networking activities that we conducted during the first years. In 2019 we can confidently state that P1 has established a good network with practitioners and researchers, both nationally and internationally. For example, the teacher conference that we organised together with Lær kidsa koding, the largest NGO in Norway for promoting coding, has seen the participation of various national actors. As another example, joining ALL DIGITAL has given us the possibility to share our experience with the evaluation of activities for schools with an international community of practitioners at the ALL DIGITAL summit. A cooperation network is critical for P1 because we are addressing a very open challenge in an area that is largely outside our sphere of control with relatively limited resources, so it is important to maximise our influence.
- Number of teachers and pupils who have come in contact with Excited. Summer schools, activities in schools, and evaluation of prototypes have seen the participation of more than 200 pupils. We have also been in contact with various teachers, e.g., NKUL, where we had a stand, was attended by more than 1000 participants, including teachers, representative by IT industry for schools, school administrators; the seminar hold for the online course on programming for in-service teachers targeted almost 100 teachers registered to the course.

## On-going activities that will continue in 2020

- Continuous engagement with relevant communities. For 2020 we do not foresee any major change of direction. We have identified our focal points and we aim to continue along the same path. At the same time, we recognise the importance of being open to opportunities that can emerge thanks to our cooperation network. Most importantly, we see the need to address emerging needs in the community. It is a rather challenging period for IT in schools. The new curriculum is creating new possibilities, but it is demanding for individual teachers and schools who are in need to develop new competencies and skills. Our priorities have necessarily to take into account new needs to keep our work relevant.
- Gender gap. Our initial studies pointed out a considerable gap in IT education, starting in lower secondary schools. We have a number of ongoing activities that aim to understand this challenge and to propose some solutions. In this area, additional funding has been secured by Nord/Steinkjer through the NordPlus project "Girls just wanna have fundamental IT-skills".
- Consolidation of results. P1 will work to package the learning resources developed so far in a way that makes them easy to adopt for teachers.
- In-service teacher training. P1 will continue the effort towards promoting and improving in-service teacher training. In addition to the existing initiatives, we will investigate other possibilities, for example ways to support workplace learning through reflection and relevant communities of practice.



PhD  
Vojislav  
Vujošević

Vojislav Vujošević joined Excited in 2018, and has background in psychology and computer science. His research interests include technology for education and teaching practices in computer science. Coming from psychology, Vojislav finds additional inspiration in educational psychology and tries to apply some ideas and concepts to computing education.

Vojislav is working on pre-university computing education, with the focus on Computer Science teachers in Norway. One of the main interests in his research project is exploring how the teaching process could be improved beyond the curriculum. Addressing teaching itself in computing is deemed necessary because of the lack of structured curriculum, teaching guidelines, community support, and swift changes in the field of computing. Vojislav is exploring how Reflection and Cooperation, in the classroom and between educators as a community of practice, can aid and improve the work of computing teachers.

His research aim to contribute in forming a Community of practice for computing teachers that is based on research and findings. Other outcomes include improved teaching practice, easier updatability of the practice, and methods used as the field itself changes.



Simon Kvannli og Joachim Jørgensen on the job at IDI study-day. The learning assistants wear Excited t-shirts and jackets so they are easy to find and easy to approach. They also wrote their master thesis with Excited on digital Exams. Photo: NTNU/ Kai T Dragland



# P2

## Projects of Becoming



Head of Project  
Hallvard  
Trætteberg

**I joined Excited as a project leader of P2 in the fall semester of 2019. Before that I already had two important educational roles: teacher of an introductory course, and responsible for one of our degree programs. I am intrigued by the combination of the specific - making improvements in the course and program - and the generic - achieving a more fundamental understanding of learning. Thus, I really enjoy being able to devote more time to research and development in education. Excited and “Projects of Becoming” is stimulating in that respect!**

So far I am happily surprised to be met with such a welcoming attitude. Both within the center, but also how the teaching staff in all campuses seem to appreciate increased focus on educational issues, engaging with us in our work and discussions.

Projects of Becoming in 2019 has seen the intervention “IDI Study Day” move from pilot to a natural part of the first-year experience at IDI for two large study programs that otherwise have few meeting points as a group. The concept has also been developed by Excited to pilots in the other campuses, the longest running and most successful pilot so far being the “Excited workshop” series for students at Nord university.

*We see that teachers do good work within their courses, but without considering the relations between courses, within and across semesters, we can end up with a less than ideal program learning outcome and “student experience” even so. Hence, a study program perspective is needed.*

This is particularly true for the first year of a study program, where students really discover what software and CS is about, how they fit in, and embark on their journey towards becoming IT professionals.

As a center on education, it is difficult to both start and close the research loop, based on the needs of the “educational production system”. What issues are most pressing to improve and should be addressed through Excited, and how do we feed results back to both our own, national and international IT educators? In 2019 we have started interesting work looking at the large dataset we have on students’ paths through a study program, to identify where improvements are needed. Some initial findings were presented at UDIT 2019, and we look forward to continuing this work in 2020, looking at student “flows” into and through more programs.

A master student and I have started to explore the possibilities of using a new web-based IDE, gitpod, for a wide range of programming and software development courses. The question is how to utilize it in different educational scenarios, how to make a professional tool better suited for education, and how to and exploit its capabilities as a platform. With the support of Excited, we can help the staff as early adopters of exciting (pun intended) new technology. So far, the idea has been presented as a demo in one of the monthly Excited seminars and at Catch IDI, a research conference for our own students.

## Highlights from 2019

- To improve the first year experience, we want a better balance between “making the right system” and “making the system right”. In addition, we want to build a “ladder” of courses focused on professional skills, rather than theory, throughout the study program. This year we managed to make two changes in this direction. We moved our Human-Computer Interaction (HCI) course to the second semester, thus complementing the technical Object-Oriented Programming (OOP) course. Also, the 3rd semester IT project was made mandatory for both our main programs and changed to fit better between OOP and 4th semester Software Engineering (SE). In sum, these changes should improve students’ understanding of, and skills in, professional work.
- An important part of the learning environment is the tool set provided for students working on assignments and projects. This year we introduced Jupyter Notebook in the introductory programming course, and we started evaluating the web-based IDE gitpod for later courses. Both should provide easier sharing of coding examples and exercises with less technical hassle. In the future we would like to use these tools on digital exams, in accordance with Constructive Alignment.
- To know more about the students’ points of struggle, we explored the availability of data about their performance and experiences. By combining various data sources and working systematically, we can make better decisions about what to improve. This year we looked at both the national student survey (the NOKUT Study Barometer) and exam attempt data. The former was thoroughly analyzed and used in staff meetings, to identify possible causes of negative scores and remedies. The latter was the basis for our UDIT paper, where we showed how the data could help us identify courses with similar (or different) grading schemes.

## On-going activities that will continue in 2020

- The changes in the first semesters of our study programs provide opportunities for vertical alignment and coupling, like building on deliverables from earlier semesters. This could give an experience more like the real-world, where few projects are thrown away after only four months, but require more planning and coordination.
- To further build the “ladder” of courses we also want to change the onboarding of the students, i.e. the first two weeks for incoming students. Technostart, as it is called at NTNU, is an introductory program designed to ease the transition into higher education. In 2020 we aim to improve this program, aligning it better with the courses, and motivate and engage students in the computing field.
- The introduction of Jupyter Notebook will be evaluated, and we plan to have a two-step trial of gitpod, first in the OOP second semester course, and then in the third-semester IT project.



PhD  
Madeleine Lorås

Madeleine Lorås has a background in teaching computer science and mathematics. After receiving her Masters at NTNU in the spring of 2017 she joined the Excited center for her PhD in the fall. Madeleine is interested in the pedagogy and organization of introductory programming courses, as well as the educational design of the whole first year at university.

Her PhD project is about increasing our knowledge about the study behavior and performance of our undergraduate computing students. Specifically, her focus is on the first year of higher education and how the students develop their study habits, skills, strategies and tactics in order to progress towards becoming computing professionals with the skills and competencies to tackle future challenges. Through exploring various data sources, such as interviews, questionnaires, national surveys and databases, Madeleine is finding new ways to measure and evaluate students' progression through the first year. Results so far show that using these data sources in a holistic way can provide useful insights into the students' learning and studying process. One important finding is that computing students' study behavior is heavily reliant on independent studying, often alone at home. These results inform the development of first year courses, as well as study program and curriculum design.



Students that have games they need tested invite all students on campus to come and play their games. There are also media and television studies on campus, so the game designers get valuable feedback not only on how more casual gamers or non-gamers perceive the game, but on story lines and color palettes as well. Learning to do user testing as well as practicing having customers is an important part of LtC. Photo: NORD/ Line Kolås

# P3

## Learning through Construction



Head of Project  
Line Kolås

**This project aims to maintain and further develop students' interest and excitement by creative design of IT artefacts. Learning through construction is a solid tradition in CS education with many interesting aspects, e.g. customer-driven projects, industry mentors, project management, team roles, a variety of assessment types and a focus on both product and process. Further, it is important to quality assure these types of courses throughout a study program, concerning e.g. progression, constructive alignment and research-based education, which will improve the quality of LtC.**

In 2019, we continued the work on quality in LtC, and developed guidelines to ensure progression with regards to tool usage in project-based learning. The goal is to quality assure the use of digital tools throughout study programs, with a focus on defining prerequisites and to ensure that students learn to use different digital tools in the right order and know the necessary tools for their discipline. A P3 workshop in March gathered 20 teachers from all campuses in active work on LtC quality. We have had a lot of student activity in 2019. Even though we focus a lot on the learning process in LtC courses, the product is an important motivational factor if the students get tasks, which are doable and interesting.

*As a highlight from 2019, I would have to mention witnessing the students' excitement when it comes to sharing their work to a broader audience, through e.g. user testing of prototypes or actively presenting their products /prototypes in conferences and competitions.*

Worth mentioning from 2019, is the digital repository for sharing students' prototypes and products. The databank can be used in students' job applications, for research purposes, and to recruit more interesting external clients, mentors and tasks for our LtC courses. Using student prototypes as learning material is an ongoing Excited pilot, where students from similar courses in different universities will test and evaluate each other's prototypes to learn more and to learn from peers. LtC courses have specific needs for physical learning environments, and a paper about group-rooms, -furniture and -technology was published internationally. Further we will look into female students' preferences concerning computer labs, and how this influences their view on IT studies.

We have had several interesting mini-projects in 2019, many still ongoing, focusing on a variety of LtC aspects, e.g. technology (the "Imponator" MIDI sequencer, eye tracking), methods (research methods as learning methods, framework for critical thinking) and active students (peer review). Plans for 2020 is to continue the work focusing on quality in LtC, e.g. research based LtC, learning materials and use of student products. We will contribute with guidelines and share experiences.

## Highlights from 2019

- Research findings related to collective and social aspects of the computing discipline shows that project-based settings enable students to discover various ways of contribution. Students look for a challenging, but not too challenging task. They talk about the value of learning something new, but they too often take a role based on previously obtained knowledge and skills. The course design influences students' work allocation strategies. In short projects, students contribute in the fields in which they already feel competent. Project courses also encourage students to reflect on the multiple career choices and the career they envision for themselves. Identifying contributions as a valuable part of education and designing education around them could perhaps be one of many efforts needed to reshape the so far very technical identity of the computing discipline.
- Nord university nominated "GameLab as learning concept" for the National Educational Quality Prize 2019, highlighting how GameLab with its learning through construction focus is the core throughout the entire Games and Entertainment study program.
- We have tested Google's "Design Sprint" as a method to be used in the first phase of students' development projects. The aim is to develop an adapted version – to fit the needs of student game development projects. Added value reported from the student groups from the first pilot was, amongst many things, working with concepting and voting for suggested solutions and the fact that the process in it-self gave the team a better common ground for the further phases of the project.
- Students submitted prototypes from project-based courses and won the prizes "Game of the Year 2019" and "Gamer's Choice" on Norwegian Game Award 2019.

## On-going activities that will continue in 2020

- The P3 PhD work will continue to investigate, by interviews and course observation, students' experiences in active learning. In 2020, the aim is to identify what professional competencies students acquire during collaborative learning in project-based IT courses. In the times of globalization and technological advancement, there is a need for competencies like collaborating, communicating, working in interdisciplinary and multicultural teams, while computing education tends to focus on content knowledge and technical skills. The graduate attributes defined by Curtin University in Australia is an example of best practice. The aim is to create recommendations on how such attributes could be implemented in the Norwegian context.
- Increased knowledge, awareness and use of student products, through further developing the idea of connecting students across study programs and institutions, using student products as the foundation for communication, collaboration, reflection and formative peer assessment.
- Based on experiences so far and results from the P3 baseline study in 2017, we will do further investigations on important topics for increased quality in LtC courses, e.g. awareness on research based LtC and constructive alignment throughout the study programs and courses.



PhD  
Justyna  
Szykiewicz

Justyna Szykiewicz has background in Social Sciences and joined the center in 2017. Her PhD work is focused on project-based university courses where students create computing artifacts. She is using Grounded Theory Methodology to investigate the process of computing identity development, and is guided by question: What do the students in project-based learning context experience and how they are affected by this experience? Justyna is interested in computing culture, as well as in the disciplinary identity that is developed by students, teachers, faculty members and other stakeholders.

Her work is influenced by Constructivist learning theories of Vygotsky, Piaget and Papert. Learning is viewed as a social, collaborative process where students gain competences beyond disciplinary content knowledge. Though in-depth interviews with computing students in project-based courses, Justyna is investigating how role of education is not only to prepare students for work in the industry but also to help them become reflective and ethical citizens that care about the wellbeing of our societies and planet. The results of her PhD could support the courses design as well as curriculum development.



Barbara Ericson from University of Michigan gave lectures on interactive e-books; with adaptive Parsons problems. Majid Rouhani, in the middle, is newly recruited to NTNU from the industry, and new to CE education research. He is one of the many staff members cooperating with us on our research. Photo: NTNU/ Thor Nielsen



# P4

## Sharing and Diversity



Head of Project  
Rune Hjelsvold

**How do we facilitate good cross-campus learning spaces? The project “Sharing and Diversity” aims to achieve efficient learning in a multi-campus setting. With similar courses at several different campuses, shared development of learning resources among teachers should be encouraged. Students can have more courses to choose from if able to follow courses from other campuses. Cross-campus education has become a hot topic among the newly merged universities in Norway.**

Excited has had cross-campus teaching as a research topic for several years and has gained valuable experience, and in 2019 this was more widely disseminated. The paper “Challenges in Repurposing Single-Campus Courses to Multi-Campus Settings” presented at the Læringsfestivalen conference in Trondheim in May made our work known on the national arena. NOKUT was among the participants who found our work interesting and timely and, therefore, invited us to participate in their podcast on best practice in higher education in Norway.

In our work, we have observed some misconceptions among university leaders and teaching staff who lack prior experience in cross campus education. They typically underestimate how much preparation is required to ensure good cross campus offering, and the amount of resources required to facilitate good cross campus learning activities.

During 2019, we have drafted a process guide for how to prepare, plan, deliver, and evaluate cross-campus education, and we hope this guide will improve the quality of such course offerings. We have gotten acceptance of Excited papers in international conferences, indicating that we are working on issues of current interest within the international community.

*Being part of an SFU has made it considerably easier to initiate and coordinate new educational development projects, to share teaching experiences, to get educational topics onto the department agenda, and to conduct research related to computer science education.*

*It also means that you have the opportunity to learn more about research on the weaknesses of current practices, and about new and alternative ways of teaching. You also meet educators with valuable experiences that they happily share. This has also motivated me towards an increased focus on improving my own teaching practices.*

## Highlights from 2019

- Our work on cross-campus teaching and learning was recognised by NOKUT, resulting in an invitation to participate in their podcast, *NOKUT-podden*. There, Excited and one of the teachers involved in a cross-campus course shared our experiences in the episode titled “*Den om undervisning på tvers av studiesteder*”.
- We have been invited to present our findings in cross-campus teaching and learning in several internal seminars at various departments within NTNU. Several departments are considering or planning to offer multi-campus courses and are eager to learn from our experiences.
- We have developed a process model for how to plan, deliver, and monitor cross-campus teaching and learning. The model is based on existing theory combined with our empirical findings.
- Several students have done projects on tools for supporting reflection and for continuous self-assessment.

## On-going activities that will continue in 2020

- We will continue working with IDI and other departments within NTNU, sharing our current findings and acquiring new ones.
- We will put our newly developed process model to actual use – to assess its qualities and to refine.
- We will continue working on tools for supporting students’ reflection and continuous self-assessment.



PhD  
Abdullah  
Bahmani

Abdullah Bahmani joined Excited in 2018 and has a background in software engineering from Iran. He has worked in both academia and industry for more than ten years. His current research interest is organizational change, particularly at higher education institutions and how it could be facilitated by providing research-based guidelines.

As a Ph.D. candidate, he is working on multi-campus education. He developed a conceptual framework for multi-campus course development. Moreover, he is working closely with two study program leaders in Trondheim and Gjøvik, who started the development and establishment of a multi-campus study program at NTNU. Ongoing research is on assessing teachers' readiness for multi-campus activities, with a survey for the target group. He aims at making this study and their answers relevant for university policy makers to take appropriate actions. Besides, Abdullah is working on a systematic mapping review for categorizing the current literature in the applied area to identify the gaps.

In the future, Abdullah is aiming at implementing some practical tools based on his research. Such tools are beneficial for higher education institutions facilitating the process of adapting to the new educational settings.



• More than 700 students complete their bachelor or master degrees in IT each year in our study programs at NTNU/IDI and Nord University. The candidates are highly attractive in the work market. In Excited we look into what it is that makes the candidates employable and how we best can help the students prepare for their careers, taking into account that technology and society are rapidly changing. Great challenges await IT professionals in the future, and higher IT education needs to follow suit and equip our candidates with the necessary competence. Photo: NTNU/ Kai T Dragland

# P5

## Career Readiness



Head of Project  
Birgit Rognebakke  
Krogstie

**We are interested in how we educate IT students to become knowledgeable, skilled, motivated candidates able to take on the challenges in work life. Career Readiness aims to strengthen and expand the education-work connectivity by providing students' with "real-life industry-driven" learning.**

To make good career choices and be motivated for study and work, the students need to have an understanding of their own competence. The e-portfolio helps students build this understanding by having to make their competence explicit and reflect on their own learning. To succeed with the introduction of e-portfolio, the implementation process itself is critical, and the professional teachers have a central role. In 2019 we have conducted empirical studies to develop good processes and tools for introducing and using e-portfolio. For the general IT candidates, the work market is currently very good – they generally have little problems finding a job. Even so, we need to prepare them to do the best job possible, as part of educating candidates for a better society. For our study programs at Nord on the other hand, in game design, the candidates face a different reality.

In Nord Career readiness has been worked on through the Excited seminars to work on extracurricular skills like how to start an indie game company with, how to prepare yourself for internships, jobs and staying productive as well as working on how to use channels as Linked In to present yourself. Through mini projects funding, we have gained interesting results on knowledge transfer between academia and the creative industry, stressing that both tacit and explicit transfer are necessary to help the students bring their creative potential into the workplace.

Employability, that is having good chances of getting a relevant job, can be seen not only as a matter of knowledge and skills, but also as a matter of identity and belonging. In 2019 we have done empirical studies to develop new insights on what kind of perspective employers, alumni and current students have on employability and what IT education should do to help students succeed in the job market.

*The world is changing, and IT education needs to follow suit. In 2019 we arranged a panel discussion on sustainability in IT education at the annual Norwegian ICT conference, featuring participants from other universities and IT industry.*

Locally at NTNU we are currently working on how to implement sustainability in study programs, for instance by helping teachers make targeted changes to their courses. We strongly believe that to prepare our candidates for work life, sustainability is not an optional add-on, but an absolutely fundamental part of professional competence

## Highlights from 2019

- Arranging the panel on sustainability in IT-education at the Norwegian IT conference. This involved colleagues from higher education in IT from all of Norway as well as from industry, which is the type of networking we need to engage in.
- The work to introduce e-portfolios in IT education has sparked great interest among the involved students and teaching staff. Whereas in practice it is challenging to not only get off to a good start with e-portfolios in a class, but also to keep the momentum of use of the portfolios over time, this is exactly a type of challenge we would like to address and overcome. Our PhD doing a project on e-portfolio has also joined an Erasmus+ project in 2019 on a Graduate skills app.
- In 2019 we took part in a periodical evaluation of one of the major study programmes linked to Excited at NTNU. We collected data through our industry network in IT, including public sector, by use of surveys and interviews, gathering valuable perspectives on how employers see our candidates.
- We participated at the MNT conference with research based on students as active researchers. One of the students was presenting at the conference. This helped us show what a great resource students can be in collecting data and interpreting findings on Career Readiness, in this case possible differences between students that may affect their chances of getting a relevant summer job.
- In the annual student survey ("Studiebarometeret") the students at the Games and Entertainment Technology study program at Nord University see their study program as exceptionally well connected to work life

## On-going activities that will continue in 2020

- The ongoing work to investigate the employability of our students will result in more insight on how we can help our students be well prepared for work as professionals in IT. The PhD work in this area finalizing in 2020 will provide valuable insight about how we can support students in developing not only skills and knowledge, but also an identity and a feeling that they belong as IT students and future professionals. In parallel, students' understanding of their own competence will continue to be a key question for the continued work on e-portfolios in the Career Readiness project.
- We will repeat the investigation of factors affecting whether students get summer jobs, which will enable us to possible changes over time compared to what we found in the survey presented at the MNT conference. In this second round we will also look more into some factors that were not explored the first time we conducted the survey.
- The work on sustainability in IT education will be continued. It is essential that this work be aligned and/or integrated with other initiatives at the faculty, university and national level, and that we continue as well as expand the collaboration with other stakeholders, particularly employers in the private and public sector. Furthermore, involving teachers in the development of course contents that profoundly links IT to sustainability is essential. We will look into this by use of investigating courses already including sustainability issues and by arranging workshops to see how sustainability can meaningfully be integrated into different types of courses.



PhD  
Hege Annette  
Olstad

Hege Annette Olstad has a master's degree in Digital Collaboration. Her research interest lies in the competence of IT graduates. This competence is often a topic in both the job advertisement and in the job interview itself. However, students find it challenging to understand what they are capable of when they enter the job market after higher education. Competence is an essential theme of the P5 project, which aims to strengthen the education-work connection. Hege's research will focus on how to create awareness among students on gained competence by introducing e-portfolio. Higher IT-education students may find it difficult to understand what competencies they hold when graduating. IT educations have very varied content, and because IT innovations are continuously appearing, it often adds new themes to higher IT-education.

Her research will investigate whether e-portfolios can create awareness among students on gained competencies and how to implement e-portfolio without leading to increased workload for learning institutes and teachers. Through the use of action research, Hege will try out e-portfolio and collect data from students attending second year of the bachelor's degree Digital business development.



PhD  
Gunhild  
Lundberg

Gunhild Lundberg started her Ph.D. in the beginning 2017 and has always been interested in technology. After doing her bachelor thesis in Computer Engineering, she found out that she was also fascinated by the cooperation between humans, and how they affect each other. She took a year studying sociology, before she took a master in Digital Collaboration. Here she got to combine both technology and human interaction. Gunhild conducts research on the Transition from Higher Education to Employment for IT-students.

Through the use of mixed-methods, Gunhild collects data from students and alumni from a computer science department, as well as those who hire these graduates. This gives insight to both the employer and the (future) employee perspective. She is expanding the term employability from only including skills, knowledge, and personal attributes, to also include identity formation and awareness of employment possibilities. Putting more emphasis on these aspects will increase students career-readiness and ability to put their curricula in a bigger context.







# Highlights & Stories

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## ● ● ● Excited in Ålesund

When Excited started in 2017, Ottar Osen in the department of ICT and Natural Sciences saw the announcement on our Intranet, and immediately got “excited”. Especially reading about the project P3 - Learning through Construction (LTC). Osen teaches engineering, and has always been interested in project-based learning. “I sent an e-mail to Line Kolås and said that I wanted to participate”, says Osen. He applied for funding through the mini projects on the first call, his mini projects featured in this report as one of the success stories for increasing teachers’ interest in development and research of their own teaching practice. In 2019 he joined the Excited management group representing campus Ålesund.

### Seed funding and coordination

“Excited has created a venue for education related activities in the computer science domain. Before Excited these activities were poorly coordinated and scarce”, says Osen. “Excited has brought coordination and seed funding, making many interesting activities that both teachers and students benefit from. In Excited, we think that building a good study environment for the students is a very important part of improving the quality. When we are able to engage the students with summer jobs to work on projects building teaching and recruitment material, we see an effect that is bigger than just getting better assignments for next year,” Osen continues. And after three years, the experience is that getting to know the student assistants better through these research projects and summer jobs, they return as better and more engaged student assistants, thus improving the quality of the seminar work and the student environment even more.

*“Now, after a year in the management group I must say that it is inspiring to be part of a community that puts emphasis on education. Since we are a university, we have an obligation to push for better education through research”*

“In 2019 we have started booking a meeting room in Ålesund when Excited seminars are streamed from Trondheim, so that we can follow them together rather than individually in our offices. This has been a very good way for the faculty to take the time to discuss education and education research. This year I have been positively surprised by the interest my colleagues shows in the Excited activities. Excited has proved to be an important venue for many colleagues interested in teaching and education. And the mini projects are an important part of this”.



Girls joined Ålesund International School on the team. The school was very interested in the project, and school pupils in 3rd and 4th grade participated as clients for the students. The project ended with a gaming workshop in the MakerSpace room in Ålesund International School. Students presented their games and all school students could try out all the games. It was a big event with prizes for best games. Photo: NTNU/Girts Strazdins

# ● Mini Projects – Seed Funding ● to Inspire and Engage

**Mini projects through Excited are an opportunity to get extra resources for improvement measures in courses or study programs that go beyond normal operation or management of teaching. The target group is academic and administrative employees involved in education at Nord and at NTNU (primarily IDI plus computer science at IIR).**

This has proved a great way for staff to take part in the SFU, and to get that little extra motivation to do research on ones own educational practice . This far, we have had over 40 mini projects receiving funding, stretching from simply getting hours from our student assistant pool, and upwards to 100 000 NOK, based on the scope of the project.

The status of the Center for Excellence in IT Education gives us the opportunity to create a space for dialogue between teachers who teach in the same subject area, so that an environment can be created to develop the teaching, says Robin Munkvold from Nord University. Robin teaches in the Bachelor of Games and Entertainment Technology, and has a coordinating role for Excited's activities at Nord university. "Through the center status, we get more attention and interest from faculty, and also from our leaders," says Robin Munkvold. Once we get the attention, we can be agile and quick to grant the little extra support that makes the piloting of new methods more feasible for the subject teachers in a busy everyday life.

"As a center we have leaders at NTNU and Nord supporting us, they work at supporting development and innovation in teaching methods. At the same time, as a center, we have our own funds that we can announce in connection with smaller projects. This type of low threshold support means that more people can try out new methods and further improve upon methods that already work well. This gives us a good framework for both discussing and developing IT education", Robin concludes.

An application must be based on a clearly explained problem with the current situation. It must contain a clear argument for why the project can help. The results should have reuse value, measures that will depend on the same additional grant year after year, have not been accepted.

### What we try to achieve:

- Development and / or testing of innovative methods of learning and assessment, new learning resources, measures for increased student engagement
- Measures for better quality assurance and improvement of teaching
- Measures to improve student well-being and professional-social cohesion.
- Increased collaboration across subjects, campuses and departmental boundaries
- Measures to streamline now cumbersome / monotonous tasks related to teaching or study management, to free up time for example. professional improvement

### Examples of mini projects:

- Creating teaching framework for critical thinking and research methods at IDI
- On gender and interest in IT/Technology studies; interior of computer labs
- IoT programming exercise setup
- Research on effects of TA's in LtC activities

## Gamelab – a short distance from idea to successful project

“Excited mini projects are a very agile way to support development in our teaching – there is little paperwork and administration for teachers running projects”, says Girts Strazdin associate professor at the Department of ICT and Science in Ålesund. “For example, you don’t have to spend too much time working on the format of the application. I think it’s motivating that it’s a very short distance from an idea to a project.”

Girts Strazdins in Ålesund participated in a research interview on LtC teaching done by Excited, talking about the subject he taught with a colleague, System Development and Modeling. During the conversation, he heard about GameLab and a methodology they used to teach LtC at Nord University. “The conversation inspired me to try out the method in my own subject. We were already running development projects in the subject, but it was clear that the system to be developed did not engage students, and that the subject teachers were in the role of clients.”

In conversations with Robin from Excited, we started talking a bit about game development as extra motivation, says Strazdins. Already in the first conversation, Girts became so interested in testing out the teaching method that he arranged a new meeting with Robin. Then the roles from the interview were reversed, and now it was Girts who asked the questions. “It was incredibly interesting to hear that Robin, and the others at Nord, involve students in project-based subjects where they work on game development on multiple levels: concept design, paper-based games, and game programming. This was something we also had to try out at NTNU in Ålesund.”

Once the idea was spawned, Girts sought seed funding from Excited in the form of a mini project. Part of the support was used for two student assistants in Ålesund to make a game development tutorial for the students.

Girts also included Ålesund International School in the mini project team. The school was very interested in the project, and school pupils in 3rd and 4th grade participated as clients for the students. The project ended with a gaming workshop in the MakerSpace room in Ålesund International School. Students presented their games and pupils could try the games. It was a big event with prizes for best games.

We had nine student groups in the subject, and all groups managed to deliver a playable product in the end. All students experienced a realistic scenario: real customers with real demands, real problems such as clients being unsure what they really want, changing their mind in every meeting, real development environment and tools similar to the ones they will meet in the business world.

The students also reported after the exam that the two most motivating factors in the course were the presence of external customers and the chance to develop games for real end-users.

## Dissemination for action

Part of the project funding was used to travel to the UDIT conference with a poster to disseminate the mini project’s experiences on a national arena. “The poster session was a good place to discuss this type of teaching with even more people. Some had tried gaming projects before and were interested if I had the same challenges they had encountered. Some were new to the GameLab concept and were interested in how to use it themselves in teaching.”

After the mini project, Strazdins has developed the teaching method in his course further, and has finished another mini project funded by Excited, where students transformed a previously long and little used compendium into a wiki book. The wiki book is much used and has also been a good tool for giving short references to support discussions during lectures, and for preparing exam questions.

“Excited has been an important network for me - I have been supported for the development of my teaching in several ways: contact with other colleagues with experience, arena for the exchange of ideas, and not least financial support in the form of mini projects.” concludes Girts.

Two of the mini projects in 2019 have been initiated in campus Gjøvik investigating the use of eye-tracking equipment to better understand how students work in blended environments and how students analyze query expressions when trying to understand such expressions.

Several students have participated in the experiments while some students have been recruited as research assistants for the study. Two scientific papers are being prepared based on the first project. The analysis of data gathered in the second project has just started.



Two of Excited's student assistants who has participated in research. Håvard Løkensgard left, has performed group interviews of employers, and Sondre Wold was co-author on a paper on summer jobs for students and presented it at a national conference in 2019. Photo: NTNU/ Kai T Dragland



Abdullah Bahmani, Hege Annette Olstad, Justyna Szykiewicz, Madeleine Lorås, Gunhild Marie Lundberg and Vojislav Vujošević. Photo: NTNU/ Kai T Dragland



## ● Working as a PhD candidate ● in SFU Excited

We believe that working in a research Centre like SFU Excited brings a lot of benefits. Not only are there ample opportunities to grow, learn and share with fellow experts within your field, but it is a great opportunity to network and increase your opportunities later in your career. We got a hold of 5 Excited PhD candidates and asked for their perspectives on what it means to be a PhD student in the Centre.

### The added value of working in a Centre

We know that students with a robust social network tend to thrive more in their academic pursuits than students that are lacking in this regard.

"Community", one of the PhD students exclaim when being asked what the added values of being part of Excited is. "Work as a researcher can be lonely if you're not part of a Centre like this. I think it's great that we have a place to discuss, exchange ideas and support each other" she adds.

The student in question is Justyna Szykiewicz, one of seven PhD candidates in SFU Excited. Along with her are four of her fellow students, Vojislav Vujošević, Madeleine Lorås, Abdullah Bahmani, Gunhild Marie Lundberg and Hege Annette Olstad.

The Centre is divided in five projects, as are the PhD candidates. Justyna works in project 3, "Learning through construction". There, she is learning about project-based learning courses and how students are affected by participating in them.

Through and through there is a genuinely positive attitude towards working in the Centre. The students especially highlight the social and comradery benefits. "We're not just PhD students. We are like colleagues, working in an organization and supporting each other. We have monthly seminars where we share, learn, ask questions and plan activities. There is a lot of value in that." says Abdullah Bahmani, who works in project four, "Sharing and diversity".

"I travel and attend a lot of conferences for work. Going to conferences alone could feel intimidating and kind of scary. I found that being part of a Centre helped me, both in confidence through support and companionship, but also in getting a stronger sense of representing something. I know that even if I do horrible at a talk or presentation somewhere, my team will be there to clap or laugh at my jokes. That is the kind of support that I don't think all PhDs get", Madeleine Lorås points out with a smile and a nod to her fellow students at the table. Madeleine works in project 2, "Projects of Becoming", where she measures first year computing student's learning curve.

The PhD candidates working on similar cases towards a common goal bares many benefits. Especially when compared to past experiences working in solitude. The PhD candidates becomes increasingly apparent that their reflections and experiences match the Centre's overall vision. Through close collaboration with project leaders and a shared goal of improving education, they seem to have gathered a plethora of positive experiences and helpful lessons.

### The safety net of a research Centre

When asked for specifics on what value working in a Centre brings, the candidates all agree that financial security and a

solid backbone of available project leaders and professors are major keys in allowing them to focus on their work.

"Having talked with some of my colleagues who aren't part of a Centre like Excited, I see I'm very privileged in the financial security and opportunities the Centre brings", Justyna explains.

Abdullah agrees. "We don't have to worry about the same stuff that other PhDs worry about. As an example, we can always ask our project leader questions and get feedback, which is a very comfortable situation."

They all talk warmly about the administrative coordinator at Excited, Ida Sortland who helps out in a myriad of ways, like suggesting professors to talk to, providing feedback and helpful tips for their projects.

"The centre coordinator is very open to discussion and helping out. We don't use as much time on practicalities, which allows us to focus on the important stuff", says Vojislav Vujosevic, who works in project one "Informed Decision". "We always have someone to ask, that's what a Centre is - that is the main benefit for me", Hege Annette Olstad from project five "Career Readiness" adds.

### The universal language of teamwork

Gunhild Marie Lundberg started out before the center started.

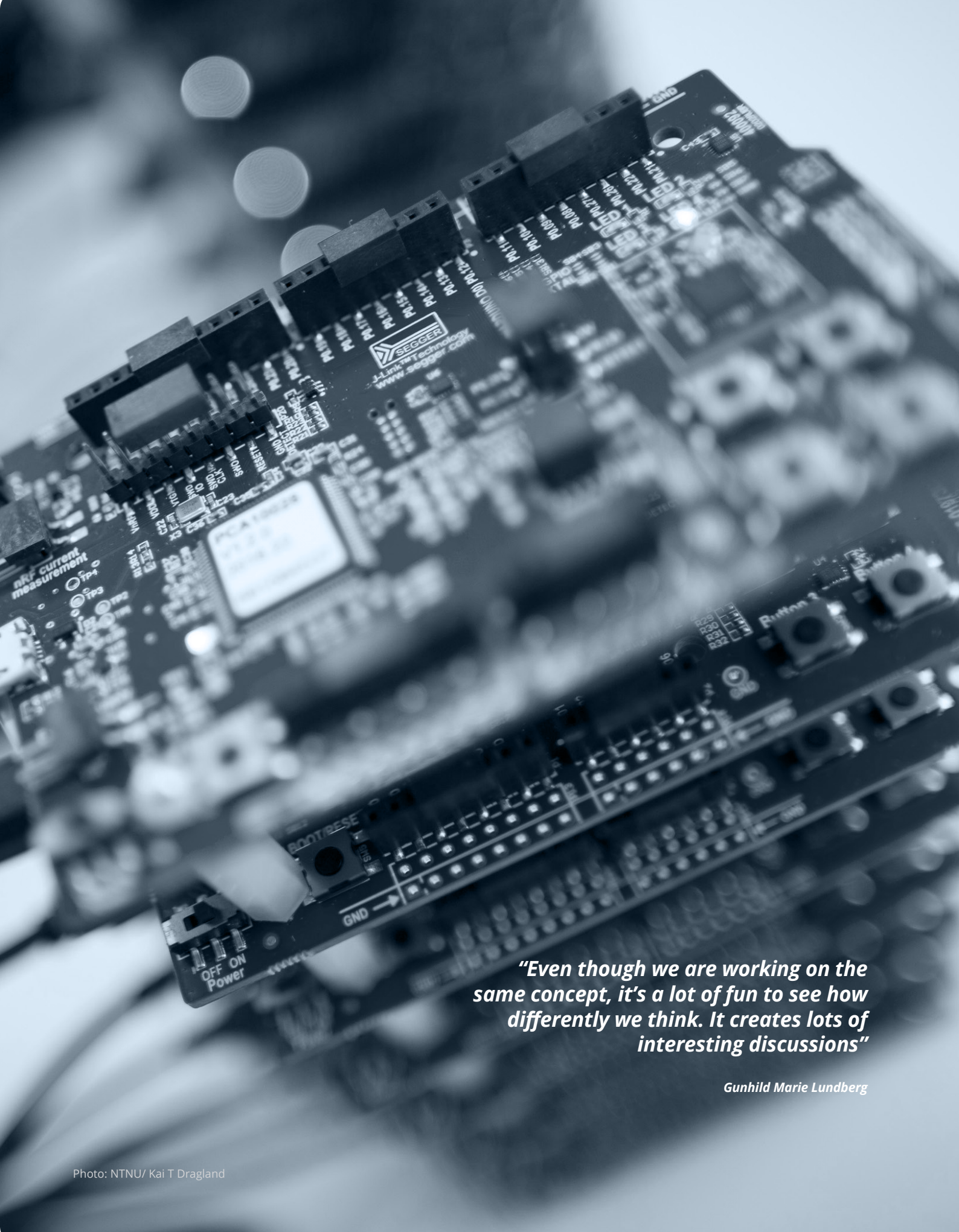
"I worked as a PhD outside of SFU Excited for about half a year." She is currently part of project 5, researching the transition from higher education to employment for IT students. "Being the only PhD in my department was rather lonely, I felt like no one really understood what I was working on. Being included in Excited changed all that." Gunhild is currently writing a paper with Justyna. They both share their experiences on working on the same topic, coming from widely different backgrounds.

"Even though we are working on the same concept, it's a lot of fun to see how differently we think. It creates lots of interesting discussions", Gunhild shares.

"Coming in with a different mindset and having a different vocabulary from each other makes it so that we have to think twice about the words we use. One word for me can mean something entirely different for Gunhild. It's a wonderful opportunity for us to learn how to communicate and collaborate effectively."

The team laughs as they think of examples where varied backgrounds and different perspectives have been sources to discussion, new paths, strain, fun and great opportunities. "Sometimes simple questions can trigger something big in your mind that fundamentally changes the roadmap for your project. If we were too like-minded, questions like these might not have come up at all" Abdullah concludes.





*"Even though we are working on the same concept, it's a lot of fun to see how differently we think. It creates lots of interesting discussions"*

*Gunhild Marie Lundberg*

# ● Summer School on Research ● in Computing Education

**In June 2019 the 1st Excited Summer School on Research in Computing Education, took place in Trondheim. PhD students, postdocs and young researchers from all over Europe attended!**

The school offered an arena for developing knowledge and skills in the area of computing education research, giving participants the opportunity to take part in learning sessions with international experts in the field, engage in discussions, and get hands-on experience with state-of-the-art tools and methods. The participants presented and discussed their work, getting feedback from experts and peers.

The topics included an overview of Computing Education as a research field with its history and politics. Computing Education research topics were covered on the individual level (e.g. adaptive learning tools; identity and employability), group level (e.g. student project teams – learning and assessment) and research on a larger scale (e.g. international Computing Education studies and learning analytics based on log data).

It was great to experience the positive attitude of the international experts when we invited them to give lectures at the school. Having a group of highly esteemed international researchers visiting was not only valuable to the participants of the school, but helped the Excited staff and other colleagues build network and get new impulses from the computing education research field.

During the school, the participants were really active in the group sessions. Also, they were eagerly using the opportunity to engage in informal discussion with each other and with the presenters in the breaks. The interesting discussions and social energy of the breaks often made it hard to convince everyone to get back to the classroom to continue the activity there! Based on the feedback that we got from participants after the school, discussion with peers and presenters was one of the most valuable aspects of participating in the summer school. We learnt a lot from this year's school and will use the experience to make an even better summer school in 2020. What we will repeat in 2020 is designing the program around the contributions of a set of international experts, with a high degree of student activity in the sessions. Also, we would like to continue limiting the number of participants to the size of a school class, so that everybody gets to know each other and gets that great feeling of being together for a week of academic and social bonding.

## **International group of lecturers In addition to NTNU researchers, we welcomed:**

- Mark Guzdial, University of Michigan
- Åsa Cajander, Uppsala University
- Tom Crick, Swansea University
- Mats Daniels, Uppsala University
- Barbara Ericson, University of Michigan
- Daniela Soares Cruzes, Sintef

## **Three Participants on “Highlights of the Summers School”**

- The very last session – PhD colloquium, there we had a unique opportunity to present our current or future piece of research idea and get valuable feedback from panel of experts. A great way to wrap-up an overall great summer school.
- The panel discussion was by far my favorite! It was so interesting to hear about the various issues and solutions all the lecturers had on their agenda. Being able to hear some of the most influential researchers in the field discuss the future was very enjoyable and inspiring.
- The summer school was an opportunity for me to get to know researchers from other institutions, countries and continents! I had the pleasure of running into a couple of the summer school attendees at the ITICSE in Aberdeen a month later. For me it was very nice to have a couple of friends to talk to in such a large conference, and it was a great way to meet even more interesting people.



The summer school brought together young researchers from 8 different countries. Photo: NTNU/Thor Nielsen



In total we had 25 participants and we were happy to discover that the gender balance was not an issue. Photo: NTNU/Thor Nielsen

## ● Excited Students with ● Exciting Results

That's the Department of Computer Science's (IDI) ambition. In SFU Excited our mission is to enhance the learning in our study programs. We believe a common path to both these goals go through more engaged students: happy and curious students with good academic results. But how do we help students become engaged, happy ,and eager to learn? The list of possibilities is close to endless. In this article, we are diving into four of them.



Kristin Karlsen and student contact at IDI Hanne Olsen receiving the Buddy Award from the Principal Gunnar Bovim. Photo: NTNU/Terje Trobe

## Research on IT education

Both IDI at NTNU and the Faculty of Social Sciences at Nord University were researching and publishing about their learning interventions and education quality even before getting the Excited SFU. But there is only so much you can do with limited research-budgets and time.

IT studies are increasingly popular, hence classes are getting bigger. "There can easily be 400 students in one auditorium, and the IDI department has an introductory programming course with 2000+ students", explains Guttorm Sindre, Director of SFU Excited. "Such big classes can easily get impersonal, with little or no contact with the professor, making feedback and follow-up of student progress challenging. Hence we need to renew our teaching approaches, to find scalable ways to student engagement and sense of belonging"

An SFU allows for more higher ambitions both regarding the type and number of new learning interventions that can be tried out, and the amount of follow-up research that can be done to evaluate them.

## Lunch-buddy

Social environment and student achievements are undoubtedly connected, as students who have a social network on campus are more likely to attend campus-based learning activities and not drop out. Unfortunately, some students struggle more socially than others.

"I wanted to do something positive for the student environment" says Kristin Karlsen, an Advisor at the NTNU IE Faculty, which IDI is part of. Her idea was Lunch-buddy, an event where students at IDI (preferably some who don't know each other from before) are matched in pairs and meet over a free lunch.

"Although the initial idea was to help improve the social environment at IDI, we also wanted to reach those who did not have anyone to study with. Those who might not have their social circle within their study-program", Karlsen explains.

Karlsen pitched the idea to Excited in the spring of 2019. She received funding for three events.

## Overwhelming feedback

Lunch-buddy turned out to be one of the most successful activities financed by Excited in 2019. "I was afraid Lunch-buddy was going to be too weird for most students. But it turned out to be so popular that we actually ended up with a positive deficit! Our funding was for 100 student lunches but over 130 students signed up" says Karlsen. IDI covered the extra cost. Two more events were held in the fall, and two more are planned in the spring of 2020.

Some of the students who attended had good social connections already, while others barely had any social connections at all. Despite the differences students had in going in, the results showed that the participants were either very pleased (69%) or pleased (31%) with the concept.

A student who has attended Lunch Buddy not once, but five times is Kristine Larssen. "It has been a blast each time. The beginning is always a little awkward, but that passes relatively quickly. You get to know people from other places in Norway and other study programs, which I find interesting and exciting", she explains.

Depth-interviews will be conducted in 2020 to gather data for further research and document the effects of Lunch-buddy.

## Positive deficit and Buddy award

The success of Lunch-buddy was also noticed outside the Department of Computer Science. During the Big Challenge conference in June 2019, Karlsen was awarded the Buddy-award (fittingly enough) on behalf of the Lunch-buddy team.

The Buddy-award is given out by NTNU's Rector to honor those who make an extra significant contribution to the student environment. "To win this award is a nice recognition for the job we have done and how Lunch-buddy has been received by the students", Karlsen said after receiving the award in June.

## Catch IDI

On a summer day in 2018, Miriam Lillebo, both a student and student contact (students who work in the IDI-administration) at the Department of Computer Science (IDI) had lunch with Excited PhD candidate Madeleine Lorås. They were talking about the IDI Christmas-party half a year earlier and how good it had been for the student environment and relationship between IDI students and staff. Lorås was also telling Lillebo about all the exciting research going on at IDI.

"We realized there was a distance between students and academic employees, where students really don't know what their lecturers are doing outside of the auditorium. Even people in neighboring offices don't know what the person next door is working on," Lorås explains. They figured there had to be a way to get all this information about the Department's research across to other students and close the gaps between IDI employees. That's when the idea of Catch IDI emerged.

"Together we figured out that a conference and a banquet was the perfect solution" Lillebo explains. At the conference, professors can present their research to the students helping them understand what is going on in the department outside lectures. At the banquet IDI students

across all study programs can mingle with each other and the Department staff. "Never underestimate the effects of a good dinner" Lorås states firmly. She has talked to several colleagues experiencing closer bonds with students after the Catch IDI banquet.

### Communication and cooperation

Catch IDI is a result of close cooperation between Excited and IDI. Together Lorås from Excited and Lillebo from IDI approached Excited Coordinator Ida Sortland. She liked the idea and encouraged them to present it to Head of the Department of Computer Science, Professor John Krogstie. He supported Catch IDI right away and was willing to fund it together with Excited, turning idea into reality. Perhaps quicker than either Lillebo or Lorås expected. The first Catch IDI was held in January 2019.

Catch IDI is by and for IDI students and employees. Still, it could never have come together the way it did without the support of Excited. Lillebo explains: "Excited provided funds so we could fly IDI students from Gjøvik to attend the Conference in Trondheim. They helped plan the Conference, helped facilitate it and made several of their learning assistants available to us".

"My experience is that the cooperation between IDI's student contacts and Excited is especially good. We have good communication across the units. When we work together, we work as one unit, not separate units" she says. Ida Sortland agrees. "The Excited staff, Excited learning assistants, IDI's student contacts, the student organizations, the professors and the department leader group all have good structured and unstructured communication between them, which gives room to find new and creative ways to work together and develop".

### An immediate success

The first Catch IDI Conference was an immediate success. "Everyone from the most experienced professors to the newest students praised the conference" Lillebo says proudly.

"I think Catch IDI's success is rooted in us reaching a wide audience" she continues. "Exciting research is presented at a student-friendly level. It's possible for students to grasp what professors do outside lectures, and for staff to see what their colleagues actually spend their time on". "An event like this lowers the bar for students and staff to talk to each other, both at the event and later at campus," Lorås adds.

"I think it's quite awesome that two young, female IT-students like Madeleine and I are the ones behind Catch IDI, in what is a quite male dominated environment", Lillebo concludes.

### Member of the board

When a position on the Excited board opened up in 2019, Miriam was the natural choice being a student at IDI and having worked closely with Excited through Catch IDI.

"I think having students on the Excited board is imperative", Lillebo says. "Excited works to improve all aspects of IT-education, and nobody knows IT-education better than the students who are in the middle of it".

### Involving students in research

"In Excited, they do research with students, not on students", says Miriam Lillebo, student at the Department of Computer Science and member of the Excited board.

### Using research to learn about research

In one of the study programs at Nord University students have to learn about Game analysis. The only problem is, there is no good intro book or how-to guide for Game analysis. Students were therefore tasked with conducting a literature review on Game analysis. "That way, students learned about two types of analysis at once" Kolås explains.

### Mini projects

Through Excited, students and staff can apply for funding for mini projects. A student who got funding was Astradur Isak Larusson.

First year students at one of Nord University's study programs have a project-based course with a lot of teamwork. Larusson started a project where he developed a training course for the team leaders, teaching them how to lead their teams. "The training was mainly in the form of weekly meetups with the team leads as well as being available when needed" he says.

According to Line Kolås, leader of Excited P3 Learning through construction "A Centre makes it possible for students to come up with ideas for projects to make their study programs better, and we have the infrastructure, a community and economic resources to start making changes at once."

### Learning assistants and research assistants

A key idea in Excited is to involve students in research. One way Excited does this is through Learning assistants. "Excited has about 20 Learning assistants, ranging from second to fifth year students", Ida Sortland says. She is the administrative coordinator for Excited, and responsible for the day-to-day contact with the assistants. "They become a link between Excited and the rest of the students".



Photo: Camerat/Thomas Jergel

“The big difference between Excited Learning assistants and normal course-allocated assistants is our assistants do much more than help other students with their studies and assignments. Our Learning assistants spend 50% of their time helping Excited researchers with everything from practicalities at conferences to actual research. They are also research assistants. This increases Excited’s research capacity”.

When Excited-researchers need assistance with their research, they are connected with an available Learning-assistant. The assistants do anything from transcribing interviews to literature reviews, anonymizing or sometimes also support analyzing data. The scheme has been so successful IDI has adopted the concept for themselves.

### **Publishing and presenting research**

Up until now two students have been so involved in research that they have ended up on the author-list. One of them is Bendik Deraas, an IDI student and Excited Learning Assistant, who in 2019 co-authored a paper and presented it at the MNT Conference.

“Writing a scientific article and seeing science in practice is very educational. You get a much better understanding of the scientific method before writing a master’s thesis. I also believe there are very few, even at a university level, who understand how research is done in practice,” he explains when asked about his research experience.

### **IDI study-day and Excited workshops**

Starting your university studies isn't necessarily a walk in the park. For most it's a whole new way of managing your life and for most individuals a whole new way of learning. You are suddenly responsible for showing up to lectures, studying on your own and completing assignments. "At the same time many are trying to figure out what IT studies actually are and who they are going to be as IT professionals", says project leader Hallvard Trætteberg. As a response to this, IDI Study-day (IDI arbeidsdag in Norwegian) was started at NTNU back in 2017, co-founded by Excited PhD Madeleine Lorås.

The goal is to help first year students get into the routine of working consistently, using the campus and working together. "One whole day each week we invite all first-year students at IDI to join a study-day. Here, our Learning Assistants help them with their studies and assignments. IDI students have a lot of mandatory assignments", Trætteberg explains.

Throughout the study-day, Learning Assistants are available to the students. Bendik Deraas is one of them. He has been with the IDI Study-days from the very beginning. "I feel the study-days have worked out really well!", Bendik points out when asked for his personal assessment of the study-days. "They have become part of the campus-identity for many students, which I think is just essential for students to have. I have no doubt the study-days have elevated our learning environment."

Lorås is continuously evaluating the study-days. Her research confirms Bendik's statement; 73% of students attending the study-days claim they work more efficiently and are more motivated to work on their studies.

### **IDI Study-days Professionalized in 2019**

"2019 has really been the year where the IDI study-days have been cemented as an integral part of IDI study programs" Lorås says. Whereas the study-days used to be loosely organized by Lorås and Excited Learning assistants, things are now professionalized to the point where Lorås can take a back-seat role. "The day-to-day operation of the study-days runs independently of me now" she says.

The IDI study-days were initiated to encourage more students to use the campus. The numbers show the students who show up for the study-days benefit from them. "Still, many students don't use the campus enough" Lorås explains. Getting a hold of the students who aren't on campus has been a huge challenge for universities in general for years. Reaching these students will get increased attention by IDI Study-days in 2020.

### **High quality learning facilitated by high quality Learning assistants**

The Learning Assistants in the study-days are trained in pedagogy. "Good training for all the learning assistants in our department is important, and something Excited is very much focused on", Trætteberg explains. Ensuring the Assistants know how to encourage learning is essential for the study-days to elevate the students learning. "We don't want them to tell the students the answer, but help them figure it out themselves", Trætteberg continues.

Karen Dahl Aarhus is one of the regulars at IDI Study-days. "We have very good access to Learning Assistants here. That's why I dedicate these days to the assignments I struggle the most with. It's a very effective form of studying. I don't think I would have managed all the assignments without this day". "I think the study-days are really good" Lars Strømholm, another regular at the study-days explain. "If nothing else, this is a reason for me to get out of my apartment and come here to work".

### **Excited about Excited workshops**

After the success of IDI Study day, we have tried out the idea in our Gjøvik campus and are looking into how to incorporate it at Ålesund. At Nord University the concept is altered to fit the needs locally and is called Excited workshops. "Our workshops are in the afternoon opening with a mini-lecture of 10 minutes, in contrast to the IDI workshops which are held during the day" Line Kolås says. She is an associate professor at Nord University and leader of Excited project P3 Learning through Construction.

"We are using the mini lectures to give students input we see they want and need, but which does not fit into the regular study plan. The Excited workshops are very popular, and has a high attendance", Kolås continues.

"I am able to get help easily and it gives me more motivation to work late" a Nord University student said when asked about the Excited Workshops.





Photo: NTNU/Kai T Dragland



Photo: Blitzbox

## ● Master Students Working ● with Excited in 2019

In 2019 Excited had 20 master students doing their master thesis on research related to Excited.



Photo: Camerat/Thomas Jergel

An example of these projects is Vegard Hellem's thesis, looking into "The Effect of Mandatory Assignments on students learning outcome and motivation in introductory programming courses." Having worked as a learning assistant for project leader Hallvard Trætteberg in his course TDT4100, Hellem knew the discussions amongst the students and staff on mandatory assignments well. He made a research design where he could test the effect of these mandatory assignments by removing them for a group of the students, and subsequently measuring the learning outcome for students with and without mandatory assignments.

Hellem's motivation is that computer science education should be effective and quality conscious. A better understanding of how various activities contribute to students' learning could enable further educational improvement. The results of this thesis can be used as a starting point for further research into creating the best computer science education.

For Hallvard Trætteberg the study is interesting from two perspectives. As the lecturer in the course subject to the study, and as project head for P2 Projects of Becoming. "In P2 we are interested in the study program leader level, and want to do research to support decision-making for program leaders in IT", Trætteberg says. "Vegard's master project is a good example of how student driven research



Photo: NTNU/Kai T Dragland

can help inform the decisions we make as study program leaders because students are in much better position to highlight the educational and pedagogical pressure points in the students' learning trajectory."

Co-supervisor for the project was Madeleine Lorås. "This project is very interesting for my research because Hellem poses a question that has come up in my interviews with students" Lorås says. "I have found that students are very influenced, and sometimes constrained, by the educational design of the courses and programs. Mandatory assignments are one of these design elements and having him research this topic is very relevant for my research on study behavior in the first year."

By supervising Vegard's master thesis, she also got access to the very valuable data he collected. - We were also able to add some relevant questions and data collection points from Excited's perspective, which I have since used in my research. In addition, we were able to continue the research even after Vegard graduated from NTNU, which has resulted in a research paper accepted at Educon 2020 with the title; The Effect of Mandatory Assignments on Students Learning Outcome and Performance in Introductory Programming Courses. In this paper we have added the exam results as a dimension of the analysis, which is a relevant aspect to my PhD project.



Students at work on mandatory assignments at IDI study-day. Photo: NTNU/ Kai T Dragland



## All MSc level projects 2019

| Name   | Title  | Supervisor                      | Area   |
|--|--|---------------------------------|--|
| Evelyn Saxegaard                                     | CITY: An Informative Serious Game to Raise Girls' Awareness of IT  | Monica Divitini                 | Gender balance, games for learning, Technology enhanced learning |
| Marianne Magnussen & Anniken Holst                   | Code Flip: A Game for the Norwegian Elective Course of Programming   | Monica Divitini                 | Programming, games for learning, Technology enhanced learning    |
| Elena Andres   | Supporting Educators of Programming When Defining Activities With Tinkering  | Monica Divitini                 | Teacher training, programming                                    |
| June Kieu-Van Thi Bui                                | Digital Competence Among Refugees.   | Monica Divitini                 | Digital Competencies for All, Technology enhanced learning       |
| Ole-Alexander Rostad Kjeserud & Sigrid Rein Trustrup | Building Blocks for Gamification in the Digital School   | Trond Aalberg                   |  |
| Vegard Hellem  | The Effect of Mandatory Assignments on Students Motivation and Learning Outcome in Introductory Programming Courses  | Madeleine Lorås, Guttorm Sindre | Formative assessment, motivation, self-determination             |
| Andreas Haugan Aursand                               | Thematic Exercises for non-IT Students in Introductory Computer Science Course                                       | Guttorm Sindre                  | Introductory programming didactics, IT for non-IT majors         |
| Marius Oscar Moe                                     | System for Gamification of Lab Work in TDT4100   | Hallvard Trætteberg             | Gamified education, formative assessment                         |
| Sindre Aarvik Vingen                                 | Exercises and Tools for Custom Learning within Object-Oriented Programming   | Hallvard Trætteberg             |  |
| Joachim Jørgensen & Simon Kvannli                    | Efficient generation of Parsons Problems for Digital Programming Exams in Inspira                                    | Guttorm Sindre                  | Technology enhanced learning, e-assessment                       |
| Tobias Ask   | sb4e: an Open Source Integrator of the Scene Builder GUI Editor into the Eclipse IDE                                 | Hallvard Trætteberg             | Technology enhanced learning                                     |
| Henning Luick & Claus Bugge                          | Student Software Engineering Team Aid - A system for identifying and solving team issues                             | Monica Divitini                 | Capstone projects, Technology enhanced learning                  |
| Mahesh Bahadur Thapa                                 | Peer Review and Feedback Approach on Individual Reflection for Assisting Group Learning: A Web-Based Reflection Tool | Rune Hjelsvold                  | Student reflection   |
| Tarjei Holtskog                                      | Analysis of opportunities for automatic generation of SQL query exercises  | Rune Hjelsvold                  | Automatic question generation                                    |

# ● ● ● Communities of Practice

In Excited we believe that defining and maintaining a Community of Practice (CoP) with teachers and researchers within the same field can make an environment for change of practice and culture in teaching. We also consider the CoP as an important means to achieve dissemination for action. The CoP gives the teaching staff an arena for sharing information and experiences among themselves and to learn from each other.

Excited is working on building several different communities of practice - and on encouraging staff to participate in such communities. We are collaborating with the department head and staff to organize department seminars in ways that facilitates the creation of active communities within the department. Excited is also organizing communities for computer science educators where staff from other departments in NTNU and NORD are invited.

## Norway Games Education Network

As an example of these In the spring of 2019, Excited and in the spring of 2019, Robin Isfold Munkvold from Nord university initiated the Excited - Norway Games Education network, a teachers' network within the field of Games development education. The first meeting was held in Trondheim and was part of a networking conference for students, namely the Norwegian Game Awards.

When we made the initiative, the response was very positive, with many commenting that this was something they had been waiting for. For easier communication, the participants made the Facebook group GameDevTeachersNorway.

The second physical meeting was held in Bergen in October 2019, as a pre-conference workshop for the annual Konsoll Game Developers Conference. The workshop had 18 participants from eight different Games educations in Norway (mainly higher education institutions). Invited speakers were Tim Laning from Grendel Games in the Netherlands and Mark Flanagan and Andreas Suika, both from Epic Games Europe.

Laning presented the success story of Grendel Games, leading to several awards for their serious games. Flanagan and Suika introduced the Unreal game engine of Epic Games and gave a short introduction on how to implement the game engine as part of an educational program. Moreover, discussion and mingling sessions helped the participants get to know each other and discuss potential collaboration

and how they could best share experiences and ideas on improving the education of future game developers.

A lot of information was gathered as part of the workshop. Many of the participating teachers/researchers were interested in topics like project based courses, group organization, project structure, student roles, follow-up during the semester, student assessment, and industry connectivity. As a center for excellent IT-education, we plan to follow up on these inputs and help develop the quality of Games educations in Norway.

We are now planning the third networking workshop , where the goal will be to decide on very specific ideas for the continuing collaboration, based from the input from the workshop in Bergen.



Photo: NORD/ Gregory Joseph Curda

### Communities of Practice as a vehicle for change

Establishing and maintaining a CoP with teachers and researchers within the same subject area gives us an enhanced opportunity to learn from each other and improve the quality of our practices when it comes to teaching, learning activities and learning resources. Through a CoP we are able to share practices and content, enable dialogue, introduce collaborative processes - and hopefully create new knowledge.

# ● Girls Just Wanna have Fun- ● damental IT-skills

**Teachers and young girls mention the same problems when we ask them why there are so few female IT students. There are few role models, and limited knowledge among teenagers about career possibilities. When it comes to Girls and technology – awareness becomes a key word.**

As part of the Project “Informed decisions”, NORD initiated a Nordic project on Girls and creative technology with the Excited and Nordplus funded project “Girls just wanna have fun-damental IT-skills - The recruitment of female students to programming, games and creative IT studies at University level”.

The project aims to increase the proportion of female students in creative IT studies at University level. Universities are important gateways to the industry.

We collaborate closely with secondary schools (focusing on the upper secondary level) as well as gender equality centers and representatives of the industry.

In 2019 we held workshops and thematic events for secondary schools that aimed to

- increase the interest of young women in creative IT-studies and
- increase the self-efficacy of young women within these disciplines.

The goal is to enhance awareness regarding the importance of gender balance in these areas, on the secondary school level. We hope that this focus will inspire more young women, including those with diverse backgrounds, to apply for university studies within creative IT studies, thus contributing to the integration and a more balanced gender proportions amongst university graduates – leading to better gender balance in the creative IT workforce.

The project has launched a website where the teachers and pupils can find role models and creative IT tools.

## **We surveyed both teachers and pupils**

As a research based project, we had both the teachers and the pupils fill in a survey on perceived reasons why girls do not select technology subjects at school, and what measures they think are useful for making girls more interested in tech subjects.

Teachers tend to respond that there is too little information about the possibilities, and that social norms and lack of role models discourage girls from choosing technology, as it is perceived as an area dominated by males.

Concerning improvement, teachers mostly suggest better information, the promotion of role models, and the possibility of visiting relevant companies and University studies.

When asked to choose three measures from a list of 23 measures, the following were the most chosen ones:

- Deployment in IT / technology-oriented fields of study at higher level
- Trial day at the game study at Nord University
- Getting to meet female role models within the field of IT / technology

The answers of the younger girls, show a similar pattern. One thing that is mentioned by almost 80% of the girls is the importance of parents’ support. When being asked about the three most important measures, the younger girls give exactly the same suggestions as the teachers.

## **NORD Publications from this Project**

- Empowering Women to Seek Careers in Game Development and Creative IT Studies, 2019. Conference on e-Business, e-Services and e-Society I3E 2019: Digital Transformation for a Sustainable Society in the 21st Century pp 103-115. Sigurdardottir, Helga Dis Isfold
- Norwegian Game-Based Learning Practices – Age, Gender, Game-Playing and DGBL, 2018, Proceedings of the ... European conference on games-based learning: Volum 2018-October, s. 460-468 ; Munkvold, Robin Isfold; Sigurdardottir, Helga Dis Isfold



The learning assistant from Excited is an important role model for the girls as a female IT student.  
Photo: NORD/Line Kolås

# ● Dissemination and Quality ● Assurance work in 2019

## On the Local Level

Local dissemination has two dimensions: (i) spreading findings and increasing engagement in Excited within the university departments of Excited staff, and (ii) dissemination of results to other departments and the central level of the involved universities Nord and NTNU. Within our departments we are involved in quality assurance and improvement in various ways, such as serving on educational boards and discussing with study program leaders. Excited has given presentations in several department seminars, and we have also started a lunch seminar series where educational topics are presented – sometimes by people from within Excited, sometimes by invited guests. So far, all these seminars have been held in Trondheim, but streamed to Gjøvik and Ålesund, with good turnout (20-40 persons on site, plus the remote audience).

Our key approach for involving teachers beyond the Excited core team, has been the so-called mini projects, where teachers can get seed funding for developing and piloting educational improvement efforts. Though mostly appealing to teachers, the scheme has also been open for administrative staff, e.g., to pilot new approaches for student wellbeing. Each mini project must deliver a report afterwards, so that experiences can be shared. Many efforts which started out as mini projects have progressed into normal operation, and several of these mini projects have also been disseminated more widely, e.g., by paper presentations in national or international conferences.

Excited and the increased focus on active learning is having impact on the teaching practices at the Gjøvik campus. The most notable changes during 2019 are the use of Mentimeter as a student response system and the involvement of students in peer assessment and peer review. A group of three students did their bachelor project on a management system for computer science assignments in the Spring term. The system was tested in the Spring and have been put in ordinary use in the Autumn semester. Three other students created the project Kognita, an IT-application for making assignment work more engaging for students. Excited agreed with the students behind Kognita to support them in doing a bachelor project on the idea in the Spring of 2020.

As for educational quality assurance and improvement work on the local level, most senior Excited personnel have been involved in such work one way or another. At Nord, people from Excited held a workshop about project-based learning in the university's annual Education Seminar, which gathers

study program leaders and vice-deans for education. At NTNU, both our center leader and P2 leader are members of the IDI education board. The P2 leader is also program responsible for master study programs at IDI. The P1 leader is on the program board of the Natural Science with Teacher Education study program. During the last five years the CS specialization of this program has seen a 50% enrollment growth, and Excited is contributing to improving the learning environment. The P2 PhD candidate, herself a graduate from that program, is being counsellor for these teacher education students, and she is also a participant in the project "Tech Studies of the Future", scheduled to propose in 2021 a major overhaul of both the 3 and 5 year engineering and technology studies at the entire NTNU. The leader of P4 has been involved in the steering group of the project for "Interactive learning areas in a cross-campus setting", and in the process of streamlining a study program that was merged across three NTNU campuses (Ålesund, Gjøvik, Trondheim). In connection with the transition to digital exams, persons related to Excited have given a lot of input to NTNUs Digital Exam Project concerning possible improvements to the e-exam system Inspira Assessment. It is too early to say if these suggestions will lead to actual improvements, but if they do, this may have implications not only for future exams at NTNU but anywhere the Inspira tool is being used.

## On the National Level

A key peer-reviewed arena for IT education research in Norway is the annual Norwegian Conference on Didactics in IT Education (UDIT). Excited contributes strongly to the organization of this conference, with P5 leader Birgit Krogstie as chair (since 2017), several PC members, and by submitting papers. Strong participation in this conference is essential for networking among university level IT educators, disseminating our own research and getting impulses from colleagues at other Norwegian learning institutions. Excited also sponsored the UDIT keynote, bringing an internationally acclaimed scientist in the area of IT education to the conference. This creates visibility among IT teaching staff in Norwegian universities and adds to our international network.

There are also other national conferences for disseminating new teaching practices, on a somewhat less formal level (e.g., not having a strict peer-review process, allowing more popular presentations). The most important ones are NKUL (annually, on pre-university education), Læringsfestivalen (annually, higher education in general), and MNT-



konferansen (bi-annually, STEM education). We have participated with several contributions in each of these, and were especially strongly represented at MNT-konferansen, with papers by senior personnel, PhD candidates, and some where undergraduate students were co-authors and presenters. We have also been involved in several informal and popular dissemination activities, such as seminar talks and media interviews (see publication list). Of particular notice is the NOKUT podcast interview of P4 leader Rune Hjelsvold and assoc.prof. Harald Øverby about challenges with cross-campus teaching. This generated a lot of interest on the national level, and Hjelsvold has since been invited to several other universities / departments to tell about his experiences in more detail.

We had students at a maker fair in Trondheim, as part of P2, and Excited student assistants have made notable contributions at SFU student network meetings. Excited is also supporting student-driven dissemination, e.g. how-to-courses about useful IT tools. For P1, dissemination has also targeted teachers and pupils as main stakeholders. Dissemination activities towards schools are integrated in Excited summer schools and activities, with the aim to increase awareness of IT as a career path. For teachers, Excited's results have been disseminated through conferences and courses targeting in-service teachers.

As for external quality assurance roles in other Norwegian learning institutions, Trond Aalberg is external advisor for the Bachelor and Master study programs in Informatics: Programming and System Architecture, University of Oslo, and Guttorm Sindre has a similar role for the Bachelor and Master programs in Information Science, University of Bergen, thus giving advice on course and program improvement. Monica Divitini was member of the committee for IT in the 2019 revision of the national curriculum in IT for upper secondary education in Norway. The Excited web page is also a channel for dissemination, with information about events, activities, projects, publications and other resources, plus contact information for those who want to find out more.

### On the International Level

Excited has published a good number of international peer reviewed papers, see publication list in appendix. Through participation at international conferences, we get to disseminate our own results and participate in interesting sessions with IT education researchers from other countries, some of which are stronger in IT education

research than Norway, thus hearing about the latest in innovative pedagogy within our discipline. P5 leader Birgit Krogstie participated in a working group at ITiCSE'19 in Aberdeen, Scotland, exploring the important topic of sustainability in the context of IT education.

One of our PhD candidates has participated in an Erasmus+ project, and students have represented Excited in competitions and events internationally, for instance Nord students at a conference for Games-Based Learning in Sweden. As for educational quality assurance work internationally, Trond Aalberg is external advisor for all ICT study programs at the University of Malawi, and Excited has joined all-digital.org to make impact on the European level, with Monica Divitini speaking at the All Digital Summit in Bologna, October 2019.

Our 1st International Summer School in IT Education Research, held in Trondheim, June 2019, had participation both from our own PhD candidates, from other university departments in Norway, and from abroad. It was a good arena for the PhD students to experience interesting lecture and discussion sessions with well-known international researchers in the field, and to meet PhD students from elsewhere who were interested in similar topics. Given the success of this event, we are planning to run the 2nd International Summer School already in June 2020. An even bigger event for June 2020 is our hosting of the ACM ITiCSE conference in Trondheim, expecting several hundred participants from abroad. Though the conference is taking place in 2020, much of the preparations had to be done before, so it is well worth mentioning this as part of our dissemination work for 2019, too.

*Within our departments  
we are involved in quality  
assurance and improvement in  
various ways, such as serving  
on educational boards and  
discussing with study  
program leaders*

## ● What are the Professors doing ● when they are not Lecturing?

**In 2018, a student with a summer job at the department had lunch with an Excited PhD candidate. They discussed topics like the low number of students wanting to take a PhD, what actually goes on at the university outside of lectures and the fact that students never get a chance to know their professors. Would the students be more engaged in classes, their master thesis work, and would more students consider a career in reasearch - if they knew of all the interesting research and innovations that happen at the department?**

When the rest of us came back to work that fall, they pitched an idea that had developed through the summer. Let's make a research conference for everyone at IDI with the goal of inspiring, motivating and engaging students as well as staff. We would like everyone at IDI to spend a day catching up with what's happening! That's how the conference Catch IDI was born.

In January 2019 we put the idea to play, and it was a great success with 500 participants. We say success because of the overwhelming positive feedback we got from both students and employees. We have been asked many times through 2019 WHEN the next Catch IDI will be, and never if.

Catch IDI is held on a Friday early in the spring semester. All students and employees at the department are invited to attend the event. The event starts in plenary, with a short presentation about the current state of the department and a keynote presentation by one of our professors. After this, there are several parallel sessions, where students and staff can choose between five different talks. At the end of the day there is a quiz for all participants, before the dinner with entertainment. As part of the entertainment, all three of our student bands played a little concert after dinner which is very popular among both students and staff!

We have seen a substantial increase in interest for PhD positions after Catch IDI. In 2018, we had one student applying for admission to an integrated PhD. Two more started in the scheme during the fall. After Catch IDI in 2019 we got a total for 16 qualified applicants! However, the effect of Cath IDI on this recruitment must be seen together with another jointed venture with Excited that started in the fall of 2018. We started a general scheme hiring research assistants to work with the professors on their research.

Catch IDI is a good example of what can happen when you are a host organization for an SFU and engage students to come to you with their ideas. It is funded by the department, and only a small part of the budget is from Excited. The organizing is done by Excited, and it is a very student driven project where the committee is almost all students. At the event, 20 students organize the venue, arrange the registration and implement the whole event.

### Main goals

- Build identity and a sense of belonging for students and staff across units and study programs
- Increasing students and staff's engagement by creating an informal meeting place
- Helping students make informed decisions on the possibilities in re-search as a career or further studies (PhD and Masters)



Photo: NTNU/Kai T Dragland

### What is Catch IDI?

- Approximately 400 students in all grades from over 10 different study programs.
- Approximately 100 employees from all research units and administrative departments.
- Over 20 talks, given by professors, PhDs, postdocs, alumni, master students and invited guest researchers.
- Opening speech by Pro-Rector for Education Anne Borg in 2019

### Talks at Catch IDI

- The presenters are free to choose their favorite topics, exciting research, innovative education or fun ideas.
- All talks should be on a level any student, first year though fifth, is able to follow.

### Some favorite talks from 2019:

- «Computational Creativity» by Bjørn Gambäck
- «Hacking the pacemaker ecosystem» by Guillaume Bour
- «How Shapes in Shapes Shape Shapes Around Us» by Bart van Blokland
- «The professor who misses his tail» by Dag Svanæs and Ole Kristian Knudsen

## ● ● ● Plans for 2020 and 2021

**After the first three years as a center, we are excited by the richness of the field of IT education, both from the perspective of research and practice. There are many challenges and several angles from which to address them. What issues are most suitable and pressing for Excited to improve? How do we feed results back to local, national and international IT educators?**

Related to P1, increasing political focus on IT in lower education creates a huge need for didactic competence and learning resources, and we will continue our efforts both to improve teacher education and make learning resources with broad appeal. In P2, we started a new interesting stream of work in 2019, looking at the large data set we have on students' trajectories. In 2020, we welcome a new co-worker, whose study administrative experience will help us gather and process such large data sets, so that we can use them in research to guide educational improvement.

In P3 and P4 we have gained an understanding of needs related to Learning through Construction and cross-campus education, respectively. In 2020-21 we will distill this into more concrete guidelines and make for effective sharing of experiences and resources through communities of practice. For P5, we will continue with two main streams of work, one related to investigating the employability of our candidates and how work-relevance can be improved, the other following up the pilot of student e-portfolios and (if successful) gradually disseminating this into normal practice.

Different stakeholders may be interested in different aspects of our results. The methods that we used for data gathering and analysis may be relevant even beyond the field of IT, as other study program owners need to do similar analyses. Although our focus in P3 and P4 are project-based learning and cross-campus learning in IT, many challenges of project-based and cross-campus learning are much more generic, making some results potentially interesting for a wider audience.

Hence, we need to package our results so that they are easy to find and use by others, also outside the IT discipline. While much of our early dissemination has been for awareness and understanding, the focus now will more clearly be towards dissemination for action, as we have more results to disseminate.

It is also important to ensure that our insights and approaches are transferred to normal operative practice in our university departments, so that an increased focus on educational quality and continuous renewal will persist after the extra funding through the Excited center ends.

*The ever more fast-paced change in the technology that we teach about means that a course or study program which is best practice today may soon be dated both in content and delivery method, unless its teachers and students are constantly seeking to improve it.*

How to satisfy future needs in IT education will also be a key topic both of the 2nd Excited Summer School in IT Education Research, and of the 25th Annual Conference on Innovation and Technology in Computer Science Education (ITICSE'20), both to take place in Trondheim in June 2020.



# Publications

**Only listing publications for 2019. For a complete list including also publications before or after 2019, please see Excited's web site or the Excited project in the Cistin system.**

## International peer-reviewed publications

- Bahmani, A.; Hjelmsvold, R.; Krogstie, B. R. "ICT-based challenges of repurposing a single-campus course to multi-campus settings: a pragmatic case study". Springer Publishing Company 2019 (978-3-030-29374-1), pp. 641-653
- Bahmani, A.; Hjelmsvold, R. "From Theory to Practice: Teaching Assistants' Role in Multi-Campus Education". Springer Publishing Company 2019 (978-3-030-29374-1), pp. 654-664
- Berger, E.; Sæthre, T. H.; Divitini, M. "PrivaCity: A Chatbot Game to Raise Privacy Awareness Among Teenagers". Lecture Notes in Computer Science (LNCS) 2019 (0302-9743) Vol. 11913, pp. 293-304
- Bye, R. T., and Osen, O. L. "On the Development of Laboratory Projects in Modern Engineering Education." In 2019 IEEE Global Engineering Education Conference (EDUCON), pp. 1300-1307. IEEE, 2019.
- Chirumamilla, A.; Sindre, G. "Mitigation of Cheating in Online Exams: Strengths and Limitations of Biometric Authentication". IGI Global 2019 (978-1-5225-7724-9), pp. 47-68
- Chirumamilla, A.; Sindre, G. "E-Assessment in Programming Courses: Towards a Digital Ecosystem Supporting Diverse Needs?" Springer Publishing Company 2019 (978-3-030-29374-1)
- Curda, G. J.; Westeren, K. I. "Knowledge Transfers Between Academia and the Creative Industry". Proceedings of the European Conference on Knowledge Management 2019 (2048-8971) Vol. 1, pp. 254-261
- Gianni, F. V.; Klecha, L.; Divitini, M. "Tiles-Reflection: Designing for Reflective Learning and Change Behaviour in the Smart City". Springer Publishing Company 2019 (978-3-319-92022-1), pp. 70-82
- Hjelmsvold, R.; Mishra, D. "Exploring and expanding GSE education with open source software development". ACM Transactions on Computing Education 2019 (1946-6226) Vol. 19 (2), pp. 1-23
- Kolås, L.; Nordseth, H. "Learning spaces for "learning through construction"". Association for the Advancement of Computing in Education 2019 (978-1-939797-42-1), pp. 941-947
- Lorås, M. "From Studying to Learning Computer Science: A study of the first-year experience of computer science education at university". Proc. ITiCSE 2019 (1942-647X), pp. 338-339
- Mangaroska, K.; Jaccheri, M. L.; Vesin, B.; Giannakos, M. "The Dynamics of Motivational and Emotional Challenges and Regulation Strategies in Customer-Driven Project-Based Learning". IEEE 2019 (978-1-7281-3485-7), pp. 367-371
- Olstad, H. A.; Rouhani, M. "Reflection on how to write the learning outcomes for an online programming course for teachers". Lecture Notes in Computer Science (LNCS) 2019 (0302-9743) Vol. 11701 LNCS, pp. 597-608
- Osen, O. L. "On the use of hardware-in-the-loop for teaching automation engineering." In 2019 IEEE Global Engineering Education Conference (EDUCON), pp. 1308-1315. IEEE, 2019.
- Pollock, I.; Alshaigy, B.; Bradley, A.; Krogstie, B. R.; Kumar, V.; Ott, L.; Peters, A.-K.; Riedesel, C.; Wallace, C. "1.5 Degrees of Separation: Computer Science Education in the Age of the Anthropocene". Proc. ITiCSE 2019 (1942-647X), pp. 263-264
- Rouhani, M.; Divitini, M.; Vujosevic, V.; Stai, S.; Olstad, H. A. "Experience report: Design of a programming course for teachers supporting flexible learning trajectories". The 8th Computer Science Education Research Conference (CSERC '19)
- Szynkiewicz, J. "Students' IT identity in Learning through Construction Courses. A Work in Progress". Proc. FIE 2019 - 49th Annual Frontiers in Education Conference: Bridging Education to the Future 2019.
- Szynkiewicz, J. "Learning through construction' influence on IT students' identity formation. Proc. ITiCSE 2019 (1942-647X), pp. 348-349
- Saxegaard, E.; Divitini, M. "CITY: A Game to Raise Girls' Awareness About Information Technology". Lecture Notes in Computer Science (LNCS) 2019 (0302-9743) Vol. 11913, pp. 268-280
- Sharma, K.; Dillenbourg, P.; Giannakos, M. "Stimuli-Based Gaze Analytics to Enhance Motivation and Learning in MOOCs". IEEE 2019 (978-1-7281-3485-7)

- Trætteberg, H.; Mavroudi, A.; Sharma, K.; Giannakos, M. "Utilizing Real-Time Descriptive Learning Analytics to Enhance Learning Programming". Springer Publishing Company 2019 (978-3-319-17727-4)
- Zakariya, Y. F.; Bjørkestøl, K.; Nilsen, H. K.; Goodchild, S.; Lorås, M. "University students' learning approaches: An adaptation of the revised two-factor study process questionnaire to Norwegian". *Studies in Educational Evaluation* 2019 (0191-491X) Vol. 64

### **National peer-reviewed Publications**

- Bahmani, A.; Hjelmsvold, R. Recorded lectures in multi-campus education: a cross-case analysis. *Proc. UDIT 2019 / NOKOBIT 2019* (1892-0748) Vol. 27 (1)
- Hjelmsvold, R.; Bahmani, A. "Challenges in Repurposing Single-Campus Courses to Multi-Campus Settings". *Læring om læring* 2019 (2535-4108) Vol. (3)
- Lorås, M.; Trætteberg, H.; Sharma, K. "Investigating students' journey through a computer science program using exam data: three new approaches". *Proc. UDIT 2019 / NIK 2019* (1892-0713)
- Lundberg, G. M.; Opland, L. E. "Perceived Employability in Online IT Education". *Proc. UDIT 2019 / NOKOBIT 2019* (1892-0748) Vol. 27 (1)
- Munkvold, R. I. «Lærerenrollen i spillbaserte læringsmiljøer». In Lekang & Olsen (ed.): «Teknologi og læringsmiljø». Oslo: Universitetsforlaget 2019 (ISBN 9788215030456), pp. 139-159
- Sindre, G. "Analyse av oppgaver og oppgavesjangre i en digital eksamen i innledende programmering". *Proc. UDIT 2019 / NOKOBIT 2019* (1892-0748) Vol. 27 (1)

### **International Conference and Seminar talks without peer review**

- Divitini, M. "Assessing the impact of coding and STEM educational initiatives: An experience". ALL DIGITAL SUMMIT 2019, Bologna, Italy, Oct 2019
- Szynkiewicz, J. IT identity in project-based learning courses. International Summer School on Grounded Theory and Qualitative Methods, Pisa, Italy, July 2019
- Szynkiewicz, J. "Computing students' contributions in project courses". Seminar at Uppsala Computing Education Research Group (UpCERG), Nov 2019

### **National Conference and Seminar Talks without peer review**

- Aalberg, T.; Lorås, M. "Motivating and engaging students for peer review as a learning activity". MNT-konferansen 2019
- Divitini, M. "The gender gap in programming - is there hope?" Online seminar for IT6204, course on Applied Programming for in-service teachers. February 2019
- Divitini, M., Jin, F., Anne Margrethe Bosch, Majid Rouhani. "Programmering på NTNU". LKK Lærerkonferanse, March 2019
- Divitini, M. "Programming in schools: A Norwegian perspective". International panel at the Excited Summer School, June 2019.
- Krogstie, B. R. "Panel discussion: How should IT education address sustainability and climate change?" Norsk Informatikkonferanse 2019
- Jin, F., Anne Margrethe Bosch, Divitini, M.. "Experiences with microprocessors in Norwegian schools". Online seminar for IT6204, course on Applied Programming for in-service teachers. March 2019
- Jin, F.; Divitini, M.. "UMI-Sci-Ed Project: Experience in Norwegian Schools". Presentation at NKUL2019, Nasjonal konferanse om bruk av IKT i utdanning og læring, May 2019
- Lorås, M.; Aalberg, T. "First Year Computer Science Study Behavior: Effects of Educational Design". MNT-konferansen 2019
- Lorås, M. «Lær å lære med Heimdall's Quest, - en gamifisert undervisningsmetode». Research and Educational Network Meeting 2019, Oslo, Jan 2019.
- Magnussen, M.; Holst, A. "Spill og programmering". LKK Lærerkonferanse, March 2019
- Munkvold, R.: «Learning through Construction Game Lab – a practical learning approach». Læringsfestivalen 2019.
- Sindre, G. "Digital eksamen i programmering – Analyse av oppgavesjangre". Læringsfestivalen 2019
- Sindre, G. "Can Technology Solve the Cheatability Trilemma?" MNT-konferansen 2019
- Sindre, G. "What Good can Digital Exams do for Constructive Alignment?" MNT-konferansen 2019
- Stålhane, T.; Deraas, B. B.; Sindre, G.; Abrahamsson, P. K. «Hva vil programvareindustrien ha?» MNT-konferansen 2019
- Wold, S.; Krogstie, B. R. "Getting a relevant summer job in IT". MNT-konferansen 2019

### Local Seminar Talks (at own university or in nearby schools)

- Kolås, L. «Prosjektbasert læring». Utdanningsseminaret Nord 2019
- Lundberg, G. M. "What makes employers hire you?" Catch IDI 2019,
- Hjelsvold, R. "(Informatikk)pedagogiske problemstillinger". Vår møte 2019
- Hjelsvold, R. "Research-based Education". MTC Workshop 2019
- Hjelsvold, R. "En merittert undervisers grublerier". NTNU Gjøviks kvalitetsseminar 2019.
- Hjelsvold, R. "Tverrcampusundervisning". NTNU Gjøviks kvalitetsseminar 2019.
- Hjelsvold, R. "Erfaringer fra tverrcampusundervisning". Instituttseminar, Institutt for informasjonssikkerhet og kommunikasjonsteknologi, nov. 2019.
- Hjelsvold, R. "Pedagogisk tilrettelegging". Seksjonsseminar, faggruppe økonomi og ledelse, des. 2019.
- Munkvold, R.I.; Kolås, L. «Forskning på egen undervisning» (Doing research on your own teaching). Seminar - Fakultet for samfunnsvitenskap 2019
- Munkvold, R.I.; Sigurdardottir, H.D.I.: «Workshop - Micro:bit og kvinnelige rollemodeller», for pupils at a local school. Seminar - kvinnelige rollemodeller og intro til Micro:bit, 5 Oct 2019.
- Munkvold, R.I.; Sigurdardottir, H.D.I.: «Workshop - Girls Just Wanna Have Fun-damental IT-skills», for teachers at a local school. Seminar for lærere - kvinnelige rollemodeller verktøy for programmering og spillutvikling 14 Oct 2019.
- Munkvold, R.I.; Sigurdardottir, H.D.I. : "Seminar for elever - kvinnelige rollemodeller verktøy for programmering og spillutvikling» (seminar for pupils on female role models in game development), 25 Nov 2019
- Sindre, G. Emneevaluering og referansegrupper – forbedringer, supplement, alternativer. PEDUP seminar 2019
- Sindre, G. Excited: Litt om senteret. Fredagskollokvium, Institutt for fysikk 2019, 2019-10-13 -
- Sindre, G. "E-assessment: Opportunities and challenges". Excited seminar Nov 2019
- Sindre, G. "Emneevaluering og referansegrupper – forbedringer, supplement, alternativer". PEDUP seminar, NTNU, Trondheim, March 2019
- Sindre, G. "Excited: Litt om senteret". Friday colloquium, Dept of Physics, NTNU, Oct 2019

### Media Contributions

- Hjelsvold, R. and Øverby, H. "Den om undervisning på tvers av studiesteder», NOKUT-podden #15 (podcast series produced by NOKUT)
- Kolås, L. «Kodet katapulter og dansende engler», interview in Snåsnningen (local newspaper)
- Kolås, L. «Programmering i skolen», opinion piece in Trønder-Avisa (local newspaper)

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