



INFORMATION ABOUT THE HOST INSTITUTION

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ABOUT THE CENTRE

Name of Centre Centre for Engaged Education through Entrepreneurship (ENgage)
Is the Centre already established at the time of the application (yes/no)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Please name any consortium partners for the Centre NTNU School of Entrepreneurship, Nord University Business School, NTNU Experts in Teamwork, NTNU TrollLABS and Spark NTNU

ABSTRACT

ENgage will develop education for students from all disciplines and professions who will constantly challenge accepted truths and innovate for the better, in both the private and public sectors. ENgage is a consortium consisting of the NTNU School of Entrepreneurship, Nord University Business School, NTNU Experts in Teamwork, TrollLABS and Spark NTNU. These excellent educational programs are each characterized by learning in which students develop projects in the real world and reflect upon their processes. Students in these programs commit to engaging in their learning, taking responsibility for their own learning, and sharing knowledge within a learning community of fellow students, previous students and faculty. ENgage will combine, develop and disseminate action-based learning, student-to-student learning, collaborative skills, rapid prototyping and student engagement. We will provide train-the-trainer courses and activities for students in all disciplines in order to increase the number of students in higher education with entrepreneurial skills.

APPLICATION DOCUMENT

The application must be written in English and follow the requirements set in this template. It must not contain more than 10 pages in Times New Roman, 12-point types, with lines spaced 1.5 and margins of 2 cm. Within this format, the applicant must provide:

a) Documentation of educational quality in existing provision

The applicant must comment and critically reflect on themes and questions set out in the criteria, and compare their existing provision with similar provision within the same subject/discipline area, both nationally and internationally. Through this, the applicant must document that the academic community qualifies as a Centre for Excellence in Education.

b) A centre plan

The applicant must comment and critically reflect on themes and questions set out in the criteria. The Centre Plan must outline the vision of the Centre, its strategy and plans. It must present the plans for the dissemination of knowledge and practices to its own institution(s) and to other educational communities as well as an evaluation and impact framework.

Appendices

The following appendices must be included (and no other):

1. A list of references
2. A budget for the Centre for the first five-year period, including motivation for costs (see guidelines at www.nokut.no/SFU/utlysninger)
3. An action plan for the Centre, including milestones (no more than three pages)
4. CVs of the proposed Centre Leader and two to five key members of the Centre team (each CV must not exceed two pages)

All appendices must be in English.

Practical information

The rector of the host institution must sign the application.

The deadline for submitting applications is set in the announcement of the call.

All applications will be published on the NOKUT website, alongside the expert panel's feedback.

APPLICATION DOCUMENT

Centre for Engaged Education through Entrepreneurship (ENgage)

The world is constantly changing, with increasing pace and intensity. These changes have profound consequences for human life—for the climate and environment, technological opportunities, business practices, public policy, safety, education, and society as a whole. This complex environment calls for citizens who have the ability to identify challenges, the will to act upon these challenges, the knowledge to acquire the resources and skills needed and the confidence to be the driving force for change, regardless of resistance. These people are the agents of change, the entrepreneurs, willing and able to make changes, engaging challenges with creativity and fearlessness. There is an urgent need to educate capable change agents and increase the number of students with entrepreneurial skills (see Ministry of Trade, Industry and Fisheries, 2015).

We must educate a new generation of self-aware students who have the ability to diagnose their own needs for skills and knowledge throughout their professional lives, as well as knowing how to use their expertise to see and meet the needs around them. These abilities must also include the willingness to be an agent of change, regardless of context: an entrepreneurial mind-set. This calls for a radical change in how universities expose students across all disciplines and professions to training in entrepreneurship, preparing them for important roles as change agents in business and society. These students are not content with merely taking a job and accepting established truths. Instead, they constantly challenge existing norms and innovate for the better, for themselves, their organizations, and society, not only for the few, but for the many. A broad ability to interpret situations and implement change is not the result of one pedagogical concept but several.

How will we educate these change agents? This can be accomplished through: (1) a world-class entrepreneurial training program, (2) providing entrepreneurial insights via action-based learning methods to all students independent of discipline or profession, (3) developing and testing new learning models to encourage entrepreneurship, (4) documenting the long-term effects of using innovative learning methods in various contexts, and (5) disseminating these insights to higher education institutions inside and outside of Norway.

The consortium as a solid basis for ENgage

The core partners in the ENgage consortium are NTNU School of Entrepreneurship (**NSE**), Nord University Business School (**Nord**), NTNU Experts in Teamwork (**EiT**), NTNU TrollLABS (**Troll**) and Spark NTNU (**Spark**). The consortium also includes several leading national and international

associate partners: Chalmers School of Entrepreneurship (Sweden), Technische Universität Berlin (Germany), North-Eastern University (Boston, USA), Young Entrepreneurship (N), Technoport (N), TrondheimTech (N), Nordtek and the Scandinavian EiT-network.

NSE was founded in 2003 at the Department of Industrial Economics and Technology Management (IØT/NTNU) based on a 30-year history of entrepreneurship education and research. In addition to the action-based Master's program, which admits students from all disciplines and professions, NSE runs a course for 1200 MSc students each year. *Nord* has provided courses and specializations in entrepreneurship at the Bachelor, MBA, MSc, and PhD levels since 1985 and has graduated 20 PhDs in entrepreneurship and innovation over the last 10 years. Nord offers a complementary context for entrepreneurship education, with rich natural resources and a dispersed population compared to the strong hub for technological research at and around NTNU. *EiT* is a compulsory course in which students apply their academic competence in interdisciplinary project work to learn collaborative skills that can be transferred to the work place. Over 2000 students take the course annually, facilitated by 80 professors and 160 learning assistants (students) from all disciplines and professions. *TrollLABS* is an experimental living lab/workshop with a vast machine park and production, materials and mechatronic facilities, as well as rapid prototyping resources. TrollLABS provides three courses with more than 200 students in the area of design thinking and product development, often using experimental project-based teaching. *Spark NTNU*, founded in 2014, facilitates idea development and venture creation with students from all study programs at NTNU. This is a project run by students and supported by faculty members and industry partners. Approximately 230 start-up teams have received guidance through Spark. Currently, about 70 start-up teams, with students from 36 different study programs, receive guidance from 17 student mentors drawn primarily from the senior class of NSE.

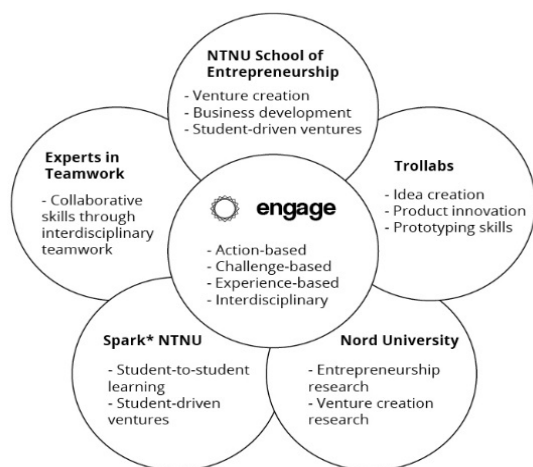
The strong outreach of the consortium reaches students in most disciplines and professions and across different campuses. ENgage also has international reach. The associate partners include several leading international institutions, and Nordtek alone represents 120,000 students, teachers and researchers from 27 Nordic technical universities. In addition to the associate partners, the consortium has strong collaborations with leading US, UK and Indian institutions and shares experiences and knowledge with the Balkans, Ukraine, Russia, Sri Lanka, Nepal and East Timor. The founders of the Scandinavian EiT network, the organizers of the national Climate Launchpad final, the managers of the Global Entrepreneurship Monitor in Norway, and the 2016 organizers of the premier international research conference in entrepreneurship (BCERC) are all members of the

consortium. The consortium also has a strong *academic* record that provides a solid basis for the centre, including two-thirds of the entrepreneurship publications in Norway (Damvad, 2011). The key faculty of ENgage have published extensively in relevant areas such as entrepreneurship education, entrepreneurial growth, teamwork and collaborations (see attached CVs).

To ensure that resources are provided, applied and monitored, the centre will have a *management group* consisting of the centre leader, Professor Roger Sørheim, WP leaders, students, and partner representatives. WP leaders include WP1, Monica Rolfsen; WP2, Martin Steinert; WP3, Øystein Widding; WP4, Gry Agnete Alsos; and WP5, Lise Aaboen. The management group has considerable experience establishing, developing and running programs and courses based on innovative learning methods, as well as developing research and cooperative projects with various industries, and participating in international networks (see attached CVs). ENgage is strongly supported at the Department, Faculty and Rector levels by all partners. ENgage will establish an advisory board with representatives from university management, industry, alumni students and international experts, including Professors Helle Neergaard (former president of ECSB) and Hans Landström (founder of CIRCLE and Sten K. Johnson Centre for Entrepreneurship).

Complementary successful educations as the starting point of ENgage

Figure 1



The ENgage partners demonstrate excellent practice-focused education. Each partner uses complementary pedagogic foundational techniques to create learning processes for their students. The scientific fields and the teaching areas are diverse, but the underlying philosophy is similar (see Figure 1). All partners emphasize knowledge as resulting “from the combination of grasping and transforming experience” (Kolb, 1984:41). In the experiential learning process, students learn about a particular subject, but they also learn about their own learning process (Kolb & Kolb, 2012). Many elements from challenge-based learning (e.g., Crawley et al. 2007) are present in these educational programs: the students solve open-ended, needs-driven problems through interdisciplinary teamwork.

By combining forces, the ENgage partners go beyond challenge-based education. Our students not only solve open problems but they also identify new problems and opportunities. Moreover, our students do not stop at delivering solution proposals; they also implement the solution and test it among users by obtaining direct, real-life feedback from external stakeholders, such as firms, investors and policy makers, in addition to traditional evaluation methods such as assignments and presentations. Student-to-student learning, which is already integrated in various physical arenas in the consortium, also plays a crucial role in students' education. In these arenas, older students assume the role of mentors for younger students. There is a strong culture of honest and constructive feedback from other students, faculty and stakeholders. For instance, the culture of contributing, *being engaged* and *supporting each other* is deeply rooted in the NSE faculty and current and past NSE students through conscious facilitation over many years. The approach of faculty is described by the students as a "hands-on approach where they have confidence in us finding and walking the road ourselves, and if we don't, we will come back and ask." Table 1 summarizes current learning practices in the consortium.

Engage Partner	Main current practices
NSE Action-based entrepreneurship education	How the students learn: Combining their experiences from their start-up with theory and the experiences of other students in a co-located community. Focus: Team <u>ownership</u> of the action-based project. Being entrepreneurs in the real world.
EiT Development of collaborative skills in interdisciplinary teams	How the students learn: Reflecting on specific collaborative situations in their teamwork, giving feedback and taking actions to improve their collaboration. Focus: Facilitation and collaborative exercises to increase <u>awareness of the group dynamics</u> .
Troll Rapid prototyping, Design thinking	How the students learn: Practicing rapid prototyping and design thinking in teams in designated facilities. Focus: The <u>process and physical artefacts</u> of the fuzzy front end of product development as part of challenge-based learning.
Spark Student-to-student learning	How the students learn: Mentoring by another student as well as providing advice to other students and reflecting on the experiences together. Focus: <u>Student-to-student facilitation</u> of team ownership of the challenge-based project. Being entrepreneurs in the "real world" based on that project.
Nord Research-based education	How the students learn: Reading, reflecting and using the literature in their own start-up processes, guided by active researchers. Work with real entrepreneurs. Focus: Student-to-student and team-based studies, <u>reflections and application</u> in practice.

NSE has been evaluated by different evaluators with remarkably good results. NOKUT's student barometer scores NSE far above average in learning, relevance for work-life learning environment and total evaluation (4.4 to 4.9 out of 5). The learning goal at NSE is to develop an entrepreneurial mindset, academic knowledge and entrepreneurial skills. NSE has two main outcomes of *achievement*: objective outcomes in new ventures, and a psychosocial outcome with change in the mindset or intentions of the students. This change in mindset was confirmed in surveys in 2012 and 2016 (Aadland and Ansteensen, 2016). As an alumni student stated, "NSE gave me a clear top competence in the labour market. The ability to see opportunities and move instantly on these to

exploit and utilize these is something I think I manage better than others, and I thank NSE for this”.¹ About 50% of NSE students continue in their own ventures after graduation, and 31 of 48 companies created at NSE in the period from 2005 to 2015 still exist. The remaining graduates become change agents in established firms: “The foundation I obtained at NSE gave me a grounding for a career as a business developer, both as an entrepreneur, consultant, and now also in the banking industry”.² NSE was elected the best Norwegian service provider by the 2014 Nordic Startup Awards. In April 2016, NSE students were selected as (1) the most innovative student project and (2) digital innovator of the year by Universum. NSE projects have won the national business plan competition Venture Cup seven years in a row.

EiT was awarded the Education Quality Award from Ministry of Education and Research in 2002 and by 2005, NIFU STEP concluded that EiT demonstrates significant success in providing “generic” skills in the field of “socio-communicative skills”. Of the entrepreneurship graduates at Nord, 21% start their own business (Kolvereid & Åmo, 2007), and there is a statistically strong relationship between participation in the program at Nord and entrepreneurial intention (Heuer & Kolvereid, 2014). Eight limited companies have so far been established based on ideas established and coached into being by Spark. The Troll course in collaboration with CERN was one of NTNU’s candidates for the NOKUT education prize in 2015.

Plans for the activities of ENgage – ‘The Centre Plan’

Entrepreneurial mind-set and acting as a change agent is important in all contexts. The university sector (Pucciarelli and Kaplan, 2016), nursing (Holleman et al. 2009) and the public sector (Arundel et al. 2015) are just a few examples. Simultaneously, higher education is changing: entrepreneurship education has moved in the direction of value creation for society at large (Blenker et al., 2011; Neck & Greene, 2011; Sarasvathy & Venkataraman, 2011), with output factors such as development of human capital (Martin et al., 2013) and beliefs about entrepreneurial aptitude (von Graevenitz et al., 2010). Thus, a strong foundation in entrepreneurship education is more applicable than ever for transforming current practices of higher education by developing a comprehensive approach to action-based education.

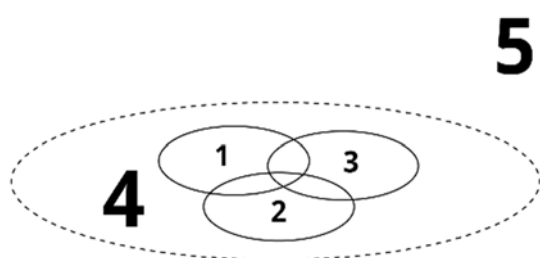
The vision of ENgage is to increase the number of students in Norway and around the world with entrepreneurial skills and the mind-set to become change agents in all contexts. The ENgage partners

¹ NSE student graduated 2014 and currently on an internship in a large international media house.

² NSE student graduated 2012 and currently a business developer in the Norwegian banking industry.

contribute with variations in action-based, challenge-based and experience-based learning models as a basis for interdisciplinary interactions and complementary skills and approaches. This is a strong foundation for developing entrepreneurial skills among students in all types of study programs. The SFU Centre Award will enable ENgage to: 1) develop, test and document new learning approaches in existing programs, courses and initiatives, and more importantly, 2) greatly enhance momentum in engaging all types of students and faculty in the development and dissemination of new learning initiatives, helping them to adopt a more engaged and entrepreneurial mindset. ENgage is a key actor for defining the content and quality of action-based education. The legacy of ENgage is to instill elements of action-based learning in all types of study programs in higher education in Norway. This means a permanent transformation of learning approaches adapted by faculty and students.

Figure 2



The centre's work is organized in 5 WPs (see Figure 2). WPs 1, 2 and 3 provide content based on collaborative skills, venture creation and rapid prototyping. These three WPs are deeply rooted in the current activities of the consortium. The centre will enable, and benefit from, the coordination gains based on the interactions

between these three WPs. WP4 develops tools for transforming teaching in all disciplines and professions towards a more action- and practice-based approach. WP4 is based on the combined activities in WPs 1, 2 and 3 but the activities in WP4 will be completely enabled and developed by the centre and therefore represent a large portion of the additional capacity provided of being an SFU awardee. WP5 documents the activities in the other WPs, measures their learning effects and disseminates them. The plan is to spread the entrepreneurial mind-set broadly during the first five years and then use the following five years to anchor the transformed practices in the different contexts. The *key steps* to fulfil these ambitions are connected to engaging students and providing teachers with the tools they need to facilitate learning. Train-the-trainer courses, summer camps and the initiation of Sparks at other campuses are important milestones (see enclosed action plan for details). Each single activity is not alone sufficient, but their combined content and momentum will lead to fulfillment of ENgage's ambitions.

WP1 – Developing collaborative skills in interdisciplinary teams

Teamwork is about being creative and efficient together. Individuals must learn to understand their own unique contribution to a group to further develop their collaborative skills. Collaborative skills are a pivotal feature of innovative interdisciplinary teams (Sawyer, 2007) and are part of the general skills required by all Norwegian students (Ministry of Education and Research, 2012). WP1 explores in depth the elements that characterize collaborative skills in interdisciplinary teams, methods for acquiring collaborative skills in an experience-based context, and ways of assessing these skills among students. It is known that group learning fosters higher-order skills and shared knowledge construction and contributes to students' engagement in learning, but there is still little knowledge on how such activities should be designed (de Hei et al., 2016).

WP2 – Venture creation methods in a research setting

Design thinking and prototyping are central to the success of new product innovations, and various formal and informal learning loops are fundamental to better understand and leverage this early phase. With WP2, the centre will enhance understanding and application of early-stage tangible and intangible learning principles, particularly related to creating, ideating, testing and learning from human–human, human–object and object–object interactions. One part of WP2 is to develop teaching methods that enable students to generate more innovative solutions faster (e.g., Kriesi et al., 2015). To increase the connection between research and commercialization, WP2 engages students in using research from their university to develop new products and viable spin-offs, for instance through prototype creation and design-thinking approaches. In addition, ENgage will give the students insights into development from product to commercialization. Thus, WP2 will be an important part of ENgage in terms of product development and methods for innovation, but it will also teach students the first steps towards creating viable businesses. Furthermore, in interaction with WP5, student projects become data sources for research on the methods and tools in product development, as well as their application in the innovation process.

WP3 – Development of venture creation programs

Internationally, there is a small but growing number of venture creation programs. WP3 will identify, map and describe leading venture creation programs using an action-based approach, i.e. teaching “through” entrepreneurship as opposed to “about” entrepreneurship or “for” entrepreneurship (Lockyer & Adams, 2014; Lackéus, 2014; Rasmussen & Sørheim, 2006). The mapping of best practices will be related to organization, content, student engagement and output. ENgage and Chalmers School of Entrepreneurship will establish an international forum of venture

creation programs that will facilitate knowledge dissemination across venture creation programs from different contexts, thereby improving the teaching methods of ENgage. This forum will manifest ENgage as a worldwide hub of teaching excellence, which in turn will benefit the dissemination efforts. Although WP3 focuses on specialized entrepreneurship education and sharing of methods with other programs seeking venture creation as an output, a key issue in WP3 will be how these programs can contribute to a permanent change of mindset in broader groups of students. This means adaption of methods but also exploring how these programs can stimulate broad change in the culture and mind-set of all students in higher education.

WP4 - Increase the number of students in higher education with entrepreneurial mind-sets and skills

Based on insights from WPs 1, 2, and 3, the aim of WP4 is to create new teaching methods in entrepreneurship education, teamwork courses and product development, thereby increasing students' engagement in their own field of study. Students will develop and apply their knowledge in a variety of field-specific contexts for the rest of their working lives. Action-based approaches to developing the skills needed to become change agents in any field must be context-sensitive and utilize the theories of that particular field of study. WP4 will develop the tools for transforming the teaching in different study programs into more action- and practice-based approaches. The projects in WP4 focus on entrepreneurship in different contexts and finding appropriate approaches for introducing action components in different disciplines and professions. WP4 is of vital importance in fulfilling the vision of ENgage: to increase the number of students in Norway and around the world with entrepreneurial skills and the mind-set to become change agents in all contexts.

WP5 - Documentation, research and dissemination of knowledge

WP5 will orchestrate the resources and projects in ENgage and create a common ground by combining knowledge, accumulating knowledge, and identifying the needs for complementary knowledge. To ensure the quality and effectiveness of the knowledge base, we will document short- and long-term effects of the use of innovative learning methods in various contexts. For example, it is important that engaged action actually leads to student-to-student learning. Student-to-student interaction, however, does not necessarily lead to student-to-student learning (Havnes et al. 2016). The actual effects of entrepreneurship education are lifelong and difficult to capture (Boyd & Vozikis, 1994; Moberg, 2013). For short-term measurement purposes, we will use established measurement instruments focusing on entrepreneurial intentions (e.g., Kolvereid, 1996; Tkachev & Kolvereid, 1999) and entrepreneurial self-efficacy (e.g. Chen et al. 1998), building on the theory of planned behaviour (cf. Ajzen, 1991). The competence to measure and study effects already exists in

the consortium. WP5 organizes the dissemination activities (see description below) that are of key importance for all WPs (see enclosed action plan).

Dissemination and institutional development

The most important part of the dissemination strategy is student engagement. Student engagement cannot be forced or taught in a course but it is vital for student learning to take place when using action-based methods, regardless of discipline or profession. The following tools are core in accomplishing broad student engagement. (1) *Interaction with SparkNTNU* to set up Spark organizations at other universities. SparkNTNU is currently helping the students at Gjøvik set up an organization similar to the one in Trondheim. (2) *Desksurfing* exchange where students can visit and work at another student incubator for a period of time. This facilitates knowledge exchange across geographical distance. NSE and Chalmers School of Entrepreneurship are already exchanging students through desksurfing. (3) *Four different student summer camps* where students come together to develop an investor-ready firm from an idea.

We complement student engagement with train-the-trainer courses for teachers and forums for department leaders (as well as faculty management and program directors) in which they will learn how action-based education will make their study programs more relevant and more attractive to students. In addition, we will utilize traditional knowledge dissemination tools (see Table 2) in new combinations: solving a case study may require that a student also listen to a podcast, visit the centre website and find articles from media and scholarly journals. As highlighted in Table 2, the dissemination strategy is partly based on resources that already exist in the consortium. Furthermore, the academic leadership of the centre is already engaged in disseminating the generated knowledge and experiences through the extensive outreach activities at NSE. The academic leadership will facilitate and coordinate dissemination activities within ENgage.

What	How	Current Resources in the Consortium
Centre Website	Collects all centre resources and makes them publicly available. Informs about centre activities.	NSE already has a website.
Train-the-Trainer	Teachers are provided with the tools they need to facilitate action-based learning.	Related courses are already offered by the consortium.
Case Studies	Norwegian case studies, including exercises that prompt the students to reflect entrepreneurially about their own context using methods from the centre.	Start-up stories from NSE and Spark. Projects from EiT and projects from Troll will be transformed into cases.
Organizing Conferences	Workshops and other activities for mutual sharing of knowledge and experiences will be arranged as part of current forums for relevant stakeholders. A new international EE Conference will be developed.	Technoport gathered more than 700 researchers, investors, entrepreneurs, students and business leaders in 2016. EiT is founder of the conference Its21, which will be used as an arena of dissemination.

Attending Conferences	Presentation of results from the activities in the centre and discussion with stakeholders. Mutual sharing of knowledge and experience. This includes conferences for education development such as CDIO and ICED.	Many engaged students are skilled presenters. NSE students have won several pitching competition awards.
International Networks	Act as a hub in international networks. Develop an international network of venture creation programs as described in WP2. Collaborate with the Nordtek workgroup on Entrepreneurship Education.	EiT is the centre of the Scandinavian Network for development of interdisciplinary education and collaborative skills. NSE organizes Climate Launch Pad and part of Climate KIC. NSE is an active member of N5T.
Journal Articles and Books	Publish results from the centre for international outreach and legitimacy.	Nord together with NSE provides 2/3 of the entrepreneurship publications in Norway.
Media Articles	Raise awareness about the centre and its activities through media.	NSE had 89 media articles from 2015 to April 2016 featuring the program, the students and the start-ups.
Visits to ENgage	Welcome visitors to the centre to see, experience and collaborate.	Ministers and industry top managers visited NSE monthly from 2014 to 2016.
Podcasts	Large-scale student-to-student learning. An entertaining way to spread concentrated information and insights. Builds a community of listeners.	The associated partner Trondheim Tech owns the infrastructure for this. Students have stories to tell.

ENgage will contribute to *institutional development at NTNU and Nord* through further development of current activities, as well as developing new activities (see Table 3).

Institutional Development	Further Development of Current Activities	Development of New Activities
NTNU	FRAM, where students interested in entrepreneurship from all study programs meet and learn from each other. Student-to-student learning. Already at EiT, Spark and NSE. Already offers courses with large outreach, where developments can be used.	Will activate students from all study programs to interact with PhD students and researchers in the large research centres. This interaction not only results in innovation projects but it also changes the mind-sets of students, researchers and teachers. ENgage will develop additional structural channels in dialogue with university management. As explained in connection with WP4 and WP5, study program leaders and institute leaders will be offered train-the-trainer courses to implement the learning in their study programs.
Nord	More systematic links between research and education. Enhancing the team-based approach to education. More systematic support of student engagement.	Activate the entrepreneurship approach to education across different study programs, such as the MBA program (>500 students) and across all Nord University departments. Develop better quality monitoring systems and documentation of results from education programs and initiatives.



COMMENTS

[Body text (150 words)]

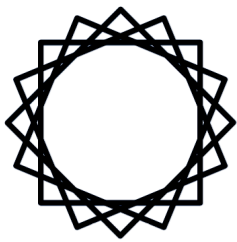
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SUPPLEMENTARY DOCUMENTATION



engage

Centre for Engaged Education through Entrepreneurship

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ENgage – Supplementary documentation

Entrepreneurship education has moved in the direction of value creation for society at large. A strong foundation in entrepreneurship education is more applicable than ever for transforming current practices of higher education by developing a comprehensive approach to action-based education. The vision of ENgage, therefore, is to increase the number of students in Norway and around the world with *entrepreneurial skills and the mindset to become change agents in a broad set of contexts*. ENgage will educate students in not only solving open problems but also identifying new problems and opportunities. Moreover, they should not stop at delivering solution proposals; they should also implement the solution and test it among users by obtaining direct, real-life feedback from external stakeholders. This calls for the development of distinct opportunity identification, problem solving, implementation and collaboration skills. The ambitions of ENgage are very much in line with the Norwegian Qualification Framework (NQF), which states that bachelor students should be familiar with entrepreneurship and innovation processes and that master students should be able to contribute to innovation and entrepreneurship practices (Kunnskapsdepartementet, 2014).

Framework for evaluation and impact

The success of ENgage should be measured on the basis of its ability to develop and disseminate action-, challenge- and experience-based entrepreneurship education methods across various contexts and disciplines, as well as to educate students with entrepreneurial skills and mindset.

ENgage will include evaluation as an integrated part of the centre's activities. Evidence-based practices will be adopted to facilitate learning and continuous development. Hence, monitoring and evaluation will be an integrated part of the centre's activities (cf. project description, particularly WP 5). From the beginning, ENgage will reach out to a large number of students and teachers at different levels, disciplines and contexts. Doing so will give a unique possibility to develop, test, implement and evaluate new education methods and tools in various contexts, as well as to learn from the comparison of results across methods, student groups and contexts. On the one hand, evaluation will be based on standard well-established measures of student learning and satisfaction, and, on the other hand, it will use specific measures on students' development of entrepreneurial skills and mindset.

First, ENgage will build on existing evaluation practices among centre partners. This includes data collected through surveys, qualitative interviews, reflection diaries, reference groups and assessment practices, as well as insights from external sources, such as the NOKUT study barometer. Collaboration with the Department of Education and Lifelong Learning at NTNU is also established to facilitate research on issues related to student learning.

Second, the development of skills and mindset among students will be measured both at the short and long terms. The evaluation of students' learning at the short term will be done with the use of recognised methods, such as measuring development in entrepreneurial intentions, entrepreneurial self-efficacy, and entrepreneurial competence and expertise during the study program. A monitoring system will be designed to measure entrepreneurial skills and mindset at the initiation, mid-way and completion of relevant study programs so that development during the programs can be monitored. The various learning contexts included in ENgage could be considered as 'living labs'. This gives the possibility to perform controlled 'experiments' using different types of methods, observations, reflection diaries, surveys and interviews.

Even more important and also more challenging to measure is the long-term impact that action-based methods have on how students perform as professionals once they have left the university, i.e. the extent to which ENgage equips students with the attitudes and skills they need to become change agents in organisations and society. This calls for longitudinal studies on the role that students play as change agents in all types of private and public organisations. Central issues will be what kind of and how much action-based education is needed to create a long-term change. In this longitudinal research set-up, ENgage will combine qualitative and quantitative methods to measure impact, including comparing students not exposed to action-based methods with students exposed to these methods. However, the short- and long-term impact of an action-based entrepreneurship education is challenging to measure. A strength of establishing a long-term financed centre is the opportunity to *develop and test new methods and frameworks that measure the impact* of action-based education.

ENgage has the resources to conduct the evaluation. Building upon already established evaluation systems at the involved institutions gives the centre a starting point for the monitoring and evaluation system. Furthermore, ENgage has already established cooperation with leading international institutions (associate partners) in this area, which secures access to the best evaluation practices in Europe and the US. With evaluation as an integrated part of the centre's activities, ENgage will employ a full-time analyst from (cf. budget). He/she will work closely with the centre's management to develop and sustain evaluation and documentation practices. From 2017, ENgage will involve five to six PhD students, with a focus on the long-term effects of action-based teaching methods in various contexts, as well as collaborate closely with the Department of Education and Lifelong Learning. Lastly, ENgage has a long tradition of directly involving students in collecting, analysing and interpreting data, as well as in implementing new/changed practices.

ENgage will monitor the dissemination and use of developed education methods. ENgage will track the diffusion of learning activities and methods, both internally at NTNU and at Nord, and among other institutions and programs, including the number of students involved. This will not only give

an overview of the dissemination of entrepreneurship education methods, but also give opportunities for learning related to implementation in new contexts and by other types of faculty. Further, after the announcement that ENgage was a finalist for the SFU award, the consortium received requests for closer cooperation with other important institutions, such as the University of Oslo, Norwegian School of Economics and BI. This indicates the potential to create impact and inspire other higher education institutions and that more universities will commit to ENgage once established. The results from ENgage will be relevant to universities and institutions in many different contexts.

Plan for dissemination

In a world where interest in entrepreneurship has decidedly increased more than ever, ENgage sees itself as a main actor in the development of the field of interdisciplinary skills, methods and innovation among students in higher education. The diffusion of innovation could be described as a two stage process (Rogers, 1995). In the initiation stage, an organisation decides whether it should adopt the innovation. The implementation stage includes the sub-processes of redefining/restructuring, clarifying and routinising. This stage can also be explained as the 'interpretation and reapplication over several learning cycles' (Lillrank, 1995: 974). In ENgage, the centre's activities are dynamic and continuously developed in interaction with stakeholders, including department heads, study program managers, teachers and students that adopt the practices.

As explained in the project description, the core of the dissemination strategy consists of collaboration with SPARK, desk surfing and student summer camps are activities to attain student engagement. These activities are complemented with the centre's website functioning as a digital knowledge hub, train-the-trainer courses, provision case studies, organizing conferences, attendance to conferences, participating in and coordinating international networks, writing of journal articles and books, generation of media articles, visits to ENgage and podcast. Depending on whether the stakeholder is in the initiation stage or the implementation stage, these activities have different roles. In the initiation stage, the stakeholder will learn more about ENgage through its networks and by attending conferences, listening to podcasts and reading books, journal articles, media articles and the centre's webpage. The stakeholder then starts to interact with ENgage and acquire additional knowledge on it either in person, by meeting faculty and students and by attending the entrepreneurship festival, Technoport and SPARK activities, or digitally, by exploring the resources available at the webpage.

When the stakeholder gradually moves over to the implementation stage, it reaches the sub-processes of redefining/restructuring, in which practices are adjusted to fit the organization and changes are made in the organization to fit such new practices (Rogers, 1995). Depending on the type of education and the context of the campus where the practices are implemented, adjustments will be made. By documenting this work, ENgage will improve the flexibility of practices over time. Because of the

strong backing and outreach at both NTNU and Nord, ENgage can start this phase from day one and thereby collect experience from many different courses, study programs and geographical locations. To enable stakeholders to front-load the implementation and thereby close knowledge gaps early in the development effort (e.g. Kennedy, 2003; Sullivan, 1986; Wheelwright and Clark, 1992), ENgage provides train-the-trainer courses for study program managers, department heads and teachers, desk surfing and summer camps for students. This way, engagement and knowledge about the practices will be reached at all levels of the stakeholder organisations. In order for the learning cycles to continue and the new practices to become clarified and routinised, stakeholders complement the internal work by continuing to interact in their networks, attending conferences, exploring webpage resources, meeting other faculty and students and attending Technoport Day, SPARK activities, desk surfing and summer camps. This facilitates not only learning for the centre but also knowledge sharing among stakeholders.

The student-driven partner, SPARK, will have a key role in involving students at all levels at NTNU and Nord. ENgage will contribute to the diffusion of the SPARK initiative to other universities and institutions, as well as enable the students involved in SPARK at NTNU to initiate the program and conduct training together with local students. As such, the SPARK initiative will become an interest group for students interested in entrepreneurship and will serve as a channel for the centre to disseminate results and best practices. Additionally, the students contribute back to and develop the centre from all locations where the SPARK initiative is successfully initiated. In the summer camps, students will have an important role in planning, developing and delivering these camps to other students (as well as the Technoport Day, the festival, conferences and seminars). All centre activities are also open to international stakeholders. At the point of application, TUBerlin, Chalmers University of Technology, North-Eastern University, Boston, Nordtek (representing 27 Nordic technical universities), and the Scandinavian EiT network were already a part of Engage as associate partners. Additional efforts focused on increasing the participation of the international community include hosting the European Entrepreneurship Education (3E) Conference during the five first years, joining in student exchange and double degrees implying the exchange of both students and teachers (ENgage will offer a double degree in entrepreneurship with TU Berlin from 2017), and conducting best practice seminars, in which venture creation program providers participate and develop their programs together and subsequently spread information about ENgage at their home university.

A webpage will be created to disseminate the centre's activities and results, as well as to communicate both at the national and international levels with those interested in learning more about ENgage and its activities.

Sustainability

The organisational backing of host institutions and the embeddedness in the organisations are the strongest guarantees for the sustainability of ENgage after the project funding ends. The top management of NTNU sees hosting a SFU as a highly prioritised goal, which will enable NTNU to use the results and development from long-term innovation to improve teaching and learning. Innovation and development in education are built into NTNU's Strategy 2011, and international collaboration in higher education is expressed in NTNU's International Action Plan 2014–2017.

Both NTNU and Nord have claimed the ambition that entrepreneurship and innovation should be a part of all study programs (in line with requirements in NQF). This is very well aligned with the core activities of ENgage, which are related to the implementation of long-term change in current teaching practices inside and outside ENgage. Thus, as a part of ordinary activities in study programs, the centre's activities will be embedded in the university structures.

Moreover, NTNU plans to invest in a new innovation centre with a 50 000 m² area. This is a long-term investment in the types of activities that are currently taking place in smaller scale at NTNU. ENgage will become a key actor in fulfilling these plans. The new NTNU Faculty of Economics and Management (in operation by 1.1. 2017) has defined entrepreneurship as a strategic area of outmost importance. At Nord, entrepreneurship is one of the three strategic pillars at the university level and a strategic top priority at the business school. Both Nord Business School and the NTNU Faculty of Economics and Management are ready to finance permanent staff employed in the centre.

As mentioned, ENgage is, from the start, very well connected with national and international associate partners. This forms the basis of the continuous development of new, related projects to be funded by regional, national and international sources. The first EU application with international partners will be filed on February 1st, 2017, with TU Berlin as a partner.

How will ENgage be after 10 years of operation? It will be a permanent world-class resource hub for action-based entrepreneurial learning. This vision calls for a combination of permanent funding and project funding. NTNU and Nord are ready to commit permanent resources after the project period. ENgage will still be organised as a centre involving at least the current partners. The centre will be embedded in the future teaching, research and innovation activities at NTNU and Nord.

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