

## ABSTRACT

Undergraduate students can learn how to be innovative in partnerships with health care institutions and private enterprises. This study portrays how a three phase innovation model was applied in an interprofessional health education context at a Danish university college.

The aim of the study was to explore midwifery, nutrition and health as well physiotherapy students' perceptions of participating in a real-life innovation project situated in antenatal care.

A total of eighteen students participated in five focus group interviews. Thematic analysis was used to interpret data findings. Data analysis revealed three themes:

'Navigating in uncertainty', 'Being part of a team' and 'Impact of project learning'.

Students found project learning to be the most relevant with regards to their clinical practice. Furthermore, study findings suggest that innovation is promoted by teamwork, interprofessional participation, mentor support and external partnerships.

Keywords: innovation, entrepreneurship, interprofessional education, collaborative learning.

## INTRODUCTION

Across Europe major political, economic and social changes have taken place over the last 2 decades. Presently, the health sector faces the challenge of economic restraints, whilst at the same time seeking to provide quality healthcare for all (WHO, 2011). In the future, health care workers need the ability to adapt to a healthcare sector undergoing change and the skills to develop quality solutions in times of economic restraints. The educational sector plays an important role in promoting innovative skills. Innovation is currently a central element in trans European policy agendas seeking to develop education (European Commission, 2013b, European Commission 2012). The national Danish curriculum of midwifery stipulates that graduates of undergraduate midwifery education programs upon completion of their education, must be able to apply established knowledge in new contexts and develop the midwifery discipline (Ministry of Science, Innovation and Higher Education, 2009). Furthermore, ICM standards for midwifery education include continuous quality improvement in midwifery programs and their outcomes (ICM, 2013). At the moment, a limited body of evidence supports or refutes innovative learning in health education. This paper seeks to investigate how students perceived their participation in an innovation project undertaken in a partnership between a university college, a large regional hospital and a private IT enterprise. The purpose of the project was to build innovative skills among midwifery, nutrition and health as well as physiotherapy students. The students were given the assignment of developing content for a new web portal in antenatal care. This paper reports on the qualitative part of a multi-method study where questionnaires and focus group interviews were used to collect data.

## BACKGROUND

Innovation originates from the mercantile industry. In this understanding of the concept, it relates to new or improved products, services or processes (OECD and Eurostat, 2013). The transition of innovation into educational contexts is linked to innovation as a key factor for societal growth and development (European Commission, 2013b, European Commission 2012). Aligning educational curriculums to political recommendations implicates learning innovative skills by practising innovation in education (European Commission, 2012).

According to the national Danish Innovation strategy, university colleges are advised to integrate innovation into existing curricula (Danish Government, 2012).

Furthermore, university colleges are encouraged to support innovation partnerships with public service providers and private enterprises (Danish Government, 2012).

Despite political recommendations, a recent report mapping joint innovation projects has shown that Danish university colleges are poorly represented in public innovation projects (DEA et al., 2012).

## LITERATURE REVIEW

Innovative learning can to some extent be compared to other learning approaches applied within health education. Innovative learning builds on the assumption that better solutions are created in teams and thus shares characteristics with collaborative learning and interprofessional education (Rogers, 2010, Kromann-Andersen and Jensen, 2009, Feingold et al., 2008). Innovative learning also

acknowledges problem solving and self-directed learning (Darsoe, 2011, Barnett, 2004, Jones and English, 2004) and thus shares characteristics with problem based learning (Spiers et al., 2014, Rowan et al., 2008, Smith and Coleman, 2008).

Innovative learning also differs from the learning approaches mentioned above. As a method, innovative learning accentuates the importance of creativity (Kromann-Andersen and Jensen, 2009, Pattison, 2006). Innovative learning seeks to improve traditional convergent thinking and divergent thinking. These two ways of thinking are needed to be creative (Kromann-Andersen and Jensen, 2009). In addition, innovative learning seeks to build action competence in students so their ideas will be turned into solutions (Darsoe, 2011, Kromann-Andersen and Jensen, 2009). Other educational differences comprise of the likely inclusion of one or more external partners in the innovation process (European Commission, 2013b, Danish Government, 2012, European Commission, 2012).

Prior studies of innovative learning have focused mainly on the entrepreneurial aspect of innovation within the context of business education (Maritz and Brown, 2013). However, Taatila (2010) argues that entrepreneurial competences are psychological and social rather than specific to an academic branch. According to Taatila (2010), the successful entrepreneur needs the skills to create and implement solutions and the willingness to work hard to achieve goals. Jones and English (2004) note that student-centered learning in innovation and entrepreneurship education provides students with the autonomy over how they learn, when they learn and where they learn. This learning approach differentiates from passive traditional

teaching, due to the fact that it requires students to be active in collaborative activities and goal-driven tasks.

Within the context of social- and healthcare education, research suggests that students best learn how to innovate by practising innovation (Id-Korhonen et al., 2011). These findings also propose that students are able to create more innovative solutions, when they cooperate with students from different professional fields and external partners.

### THE PROJECT

The innovation project was developed in 2013 in a cooperation between a midwifery program and an obstetric gynecological department. The project had dual settings and dual purposes at respectively the university college and the regional hospital. At the university college the purpose of the project was to promote innovative skills by creating an experimental learning environment where students could create digital communication solutions. The project was also a sub-project under a national welfare technology project. This project was situated at the regional hospital. The purpose of the hospital project was to improve communication by testing and implementing a new web portal for women in antenatal care. The contribution the university college made to the national welfare technology project consisted of the development of web content for the portal.

### Participants

Students at different levels within the midwifery, the nutrition and health and the physiotherapist programs were invited to participate in the project. Participation was voluntary. Alongside project signup each student chose one out of three possible web portal themes; healthy living, birth preparation and family life. The duration of project participation was three to four months. Students participated in the project as part of interdisciplinary- and elective courses or in addition to attending their regular classes. Seventy seven students signed up for the project. At the start of the project, six students withdrew their consent to participate. Seventy one students, all female, who were divided into 18 groups, took part in the project (midwifery n=44, nutrition and health n=21, physiotherapist n=6). Twelve groups were mono professional and six groups were multi professional. All 18 groups completed the project. Upon completion of the innovation project, students had produced a wide variety of web portal content including information/advice, FAQs, training programs, tests and films/animations.

Each group was supported by a mentor. The mentors were employed as lecturers at the 3 bachelor programs (midwifery n=4, nutrition- and health n=1, physiotherapy n=1). The mentors were enrolled in the project a month and a half prior to the enrollment of the students. Formal meetings were used to prepare innovation as a didactical approach. An external innovation consultant supervised the process. Upon offset of the project, the mentor's role consisted of facilitating student work and ensuring the web content met professional quality standards. During the project, the mentors met regularly to share experiences of student mentoring and discuss the progress of the project.

### The innovation process

The Creative, Innovative and Entrepreneurial (CIE) model was used to structure the innovation process. The model consisted of 3 different phases; a creative-, an innovative- and an entrepreneurial phase (Kromann-Andersen and Jensen, 2009). Each phase defined a set of tasks the students had to complete before entering the next phase of the innovation process. Each phase also offered a set of innovation tools the students could use to structure their work. The students also attended 3 workshops (figure 1). In addition to cooperating with fellow students during the workshops, the students also cooperated with each other during the innovation process to ensure that each web product was distinct.

## METHOD

### Aim

The aim of the study was to explore students' perceptions of participating in a real-life innovation project.

### Sample

Convenience sampling was used to recruit students (Malterud, 2004), however to ensure a representative sample, students from all three bachelor programs were recruited for the study. Furthermore the sample of informants consisted of students at different levels of their education ranging from first to final year. The students were recruited in the groups they had worked in during the innovation project. Five out of eighteen groups were invited to participate in the qualitative study. All five groups accepted the invitation to participate. For a variety of reasons not all group members

were present at the interviews. The final participant cohort consisted of 18 out of 22 possible students (midwifery n=12, nutrition and health n=3, physiotherapist n=3).

### Ethics

Before consenting to participate in the study, students received verbal information about the aim of the study. The students were also guaranteed anonymity and informed that responding to questions was voluntary. The study was approved by the research and development department and carried out in accordance with the 'Code of conduct for research integrity' at the university college. Due to the nature of the study aim, the study was not required to register at the national data protection agency.

### Data Collection

A mid- and post-project questionnaire consisting of open ended questions was developed to gather preliminary information on student experiences. The questionnaires were reviewed by an external evaluation consultant before distribution to all participating students. The average response rate for the 2 questionnaires was 84%. Findings from the questionnaires were first categorized and then used to guide the subsequent qualitative study. Due to the subordinate role of the questionnaires, findings from these will not be presented in this article.

A semi-structured interview guide building on findings from the questionnaires was used to collect data. A focus group approach was chosen, because it would allow the students to bring forth different viewpoints in addition to interchanging and comparing



experiences (Kvale, 1996). The interviews were performed by the author who was also the manager of the project. There can be both advantages and disadvantages to being known within the field of research (Kvale, 1996). Due to the complexity of the project, it was assumed that project insight would be an advantage to the facilitation of the focus group interviews. The project manager, though not directly involved in the supervision of the students work, facilitated the 3 workshops in cooperation with the innovation consultant and the hospital management.

The students were encouraged to describe and discuss their experiences and bring forward aspects they considered important to project participation. The interviews were performed following completion of the innovation process. The interviews took place at the educational facility and lasted approximately 60 minutes. They were audio recorded and then transcribed.

### Data analysis

Data were analysed using thematic analysis. According to Braun and Clarke (2006) thematic analysis consists of six phases. The first phase of thematic analysis includes data familiarization while the second phase encompasses initial coding of data. In the study, interview data was first read and reread several times and then organized into preliminary groups of codes. The third and fourth phase of analysis consists of the searching for potential themes and reviewing these. During these phases, initial codes were organized under broader themes and these themes were then tested against the complete data set. The last two phases of thematic analysis involve the naming and reporting of overarching themes and subthemes. In this

study, the thematic analysis identified three overarching themes, each with a number of sub themes. These were 'Navigating in uncertainty', 'Being part of a team' and 'Impact of project learning'. The following presents the study findings.

## FINDINGS

### Theme One: Navigating in uncertainty

Responses relating to uncertainty were widely represented amongst study findings. Different types of uncertainty were presented. These were uncertainties relating to being creative, undertaking student-directed learning and assuring the quality of the web portal solutions.

### Complying with the innovation process

None of the students had prior experience of working with innovation. Although inexperience was not conceived as being a disadvantage to project participation, creative processes were also viewed as being challenging. Creative processes differed, according to the students, from how they were used to working. These differences related to perceived disparities between creativity and the rationality that normally ruled educational activities.

*"We're used to using theories during the lessons. Here everything was allowed. It made sense to have an idea before having a product. But it was also hard to cut loose. It wasn't like writing an assignment...."*

(midwifery student focus group1)

Using the innovation model was generally perceived to provide structure to the innovation process. However, the innovation model also specified tasks and the amount of time the students should spend in each phase of the process. Because the students were familiar with working in an educational environment oriented towards task completion, some students found it challenging to stay in the initial phases of the innovation process.

*"...It was a little hard. Maybe we were inhibited by the fact, that we knew the end product would become a web portal...We really needed to work on not becoming too product oriented."*

(midwifery student focus group 1)

Students carried the responsibility for organizing their own work. Although the students generally found this to be a positive aspect of project participation, being in charge was also considered to be demanding.

*"We've been in charge. Normally the teacher says "this is what we do". In this sense it's been a lot less restrictive, but also more overwhelming. You don't know exactly what you're supposed to do...It's fun to try. You almost get stress from lack of boundaries."*

(midwifery student focus group 2)

*"At our program (physiotherapy) we're not used to this openness. We're used to a framework, for example a case. We're usually not allowed to define the problem...This is an entirely different way to work."*

(physiotherapy student focus group 3)

### Mentor support

Because of uncertainties related to being in an innovation process, the mentor role was described to be of key importance. According to the students, the mentor undertook a variety of tasks. Cooperating with external partners meant the students were dependent upon the mentor to assure them they were working in accordance with the overall project path. The students relied on the mentor to follow their work closely and inform them on forthcoming steps.

*"The innovative mentor creates clarity with regards to the aim of the project. It's important she makes sure the (innovation) process is predictable..."*

(midwifery student focus group 4)

Furthermore, the students depended on the mentor as a source of expertise. The mentor was expected to be acquainted with relevant literature and counsel the students on different methodologies. The mentor was also needed to assure the students that the web content they were producing, was in accordance to an acceptable professional standard.

*"My mentor should challenge my ideas. She should be inquisitive about what I am producing, especially in cases where there is a lack of quality... a place where I can receive feedback ...."*

(midwifery student focus group 4)

In addition, the students relied on the mentor to motivate them. This was especially in situations where students encountered difficulties in their work process. It was important for the students that the mentor took a keen interest in their work.

*"I need my mentor to be positive and constructive. Otherwise you lose motivation to work on."*

(midwifery student focus group 5)

### Theme two: Being part of a project team

Teamwork was, according to the students, a central part of project participation. Students participated in the project as part of a group. Furthermore, students cooperated across the three bachelor programs, with the regional hospital and with the IT enterprise.

### Group responsibility

Being respectful and responsible to other group members was reported to be important. Having to produce a product as a group, meant the students were forced to cooperate and compromise. Sometimes there appeared to be more than one

solution to a problem. However, combining individual solutions into joint solutions was also looked upon as promoting the generation of better ideas as a group.

*“You’re always an expert on something, something you previously tried...You need to be open for giving it a try, even though you personally wouldn’t have done it.”*

(midwifery student focus group 5)

Participation in the innovation project was described to entail a large workload and mutual discipline when deadlines needed to be met. According to the students, this required that each group member carried their part of the joint workload.

*“You need to be active so tasks are equally divided within the group. You have to be dutiful...when you’re part of a team...you carry the responsibility.”*

(midwifery student focus group 4)

### Interdisciplinary cooperation

Interdisciplinary participation was generally perceived to be positive. Students reported that they had learned from the other professions. They had also become more attentive of core competencies within own their profession. Although the project was situated within a midwifery context, both nutrition- and health- and physiotherapy students felt they could contribute to the project.

*"We worked with physical exercise, we know a lot about that."*

(nutrition- and health student focus group 2)

*"It was apparent that information on pelvic exercises was missing... You could say it was in our professional interest."*

(physiotherapy student focus group 3)

The students also became more conscious of the benefits of cross professional cooperation. In addition, interdisciplinary participation was perceived to have significance for the quality of the web portal content.

*"You need to be able to see beyond your own profession... You also have to be able to contribute with what you know from your profession."*

(nutrition- and health student focus group 2)

*"Our cooperation has been problem free. But if it hadn't worked, it would have been a huge challenge because you come from such different (professional) backgrounds. We've been able to learn from each other."*

(midwifery student focus group 2)

### Working with external partners

Being in a partnership with 2 external partners was described to have both limitations and benefits. However, the students reported more benefits than limitations. Some students felt economic restrictions were in conflict with having to be innovative.

*"You're told to think big...and we had a lot of ideas...in the end we had to lower our expectations, because we had to be realistic."*

(midwifery student focus group 5)

Being restricted also forced the students to be pragmatic when transforming their final ideas into web portal products. This involved decision making to determine how the best possible product could be achieved within the existing frame of resources.

*"...we needed to think in solutions that were plausible...Economic restrictions meant we couldn't produce a video. Even though economic resources were restrictive, we still wanted to make a product, so we came up with an alternative solution."*

(midwifery student focus group 2)

At the same time findings suggested the real-life project was a driving force for the students. Students found it motivating that the products they were producing would be put to use at the regional hospital. Furthermore, students felt the web portal could potentially benefit women in antenatal care.

*"I get butterflies in my stomach when I realize that this is no ordinary assignment, but something that will actually be used out in the real world. It's exciting... What you do here must pass the test in cyberspace...."*

(physiotherapy student focus group 3)



*“...it wasn’t just an assignment. Women in antenatal care will actually be using our work...It wasn’t just something one or two teachers needed to see, it was hopefully something many (women) would find useful.”*

(midwifery student focus group 2)

### Theme three: Impact of project learning

Although the innovation project aimed to develop innovative skills, project learning was perceived as being most important for clinical practice. Responses were especially connected to the second phase of the innovation process, where the students had worked with target group needs.

### Researching the target group

In addition to reviewing existing literature the students used various empirical methods to collect supplementary information. Several students had asked pregnant women to comment on their web portal ideas. These comments were used to develop their web portal products.

*“We asked if anyone would like to give us feedback on our ideas. It was quite an eye opener. Several of the ideas we had found to be relevant, the women found to be irrelevant...”*

(midwifery student focus group 4)

### From stereotyping to individualizing

Many students had come to new understandings of women in antenatal care.

Furthermore, students had discovered that a wide variety of needs existed within specific target groups.

*"I know more now about how people think. I've learned everyone is different."*

(nutrition- and health student focus group 2)

*"We have all these assumptions about the right thing to do, but if you never think about the receivers of our services, you risk using energy on something that may not be relevant at all."*

(midwifery student focus group 5)

### Reflection over clinical practice

New insight seemed to produce reflection over previous clinical practice placements.

There also seemed to be consensus to the fact that new insights would lead to different approaches in future clinical practice.

*I will be asking more (questions) on my next clinical practice placement.*

*Your own opinions and prejudice affect you. You need to see the person behind...."*

(midwifery student focus group 1)

*"In clinical practice this (the user perspective) makes good sense. It's about being there for the women. What can I offer and what does she need?"*

(midwifery student focus group 1)

## DISCUSSION

From the empirical findings it was evident that students distinguished between the more prescriptive structures of lecturer led lessons and self-directed innovation. These differences related to independently undertaking tasks but also carrying responsibilities of decision making. Findings suggested that some students had found it overwhelming to carry this responsibility. Similar findings are represented within studies of problem based learning indicating that undertaking the task of self-directed learning can promote a sense of insecurity in students (Spiers et al., 2014, Cooper and Carver, 2012, Rowan et al., 2008). From student responses, it was clear that the mentor played a key role in assuring the students were working in accordance to the overall project plan. These findings are also mirrored in previous studies showing that students in self-directed learning processes seek the reassurance of the facilitator to make sure "they are doing it right" (Cooper and Carver, 2012, Wood, 2005). In addition, the students also expected the mentor to be supportive and display a positive attitude. The need for the facilitator to take interest in the students learning processes has previously been acknowledged by Barrow et al. (2002).

At the same time self-direction was also considered to be a positive aspect of project participation. Empirical findings suggested that the students had enjoyed being “in charge” of the innovation process. Subsequently, the students seemed to benefit from being appointed more autonomy. Other studies have highlighted that students generally welcome the opportunity to engage in self-directed learning processes (Cooper and Carver, 2012, Gray and Aspland, 2011, Barrow et al., 2002).

Findings indicated that students appeared to benefit from working in teams. According to the students, group dynamics had significance for the experience of performing as a team. One aspect of group work was the necessity of all group members contributing to the work. Some studies have outlined the effectiveness of collaborative learning in training students to work effectively as a team (Cusack and O’Donoghue, 2012, Yang et al., 2012, Derbyshire and Machin, 2011). Other studies have noted that group work can be affected by students who do not contribute (Rowan et al., 2008, Carlisle and Ibbotson, 2005). Findings in this study did not indicate that group processes had inhibited the innovation process. However, due to the fact that participation was voluntary, it must also be assumed that only motivated students signed up for the project and that these students may not be representative of health education students in general.

It has been argued that interdisciplinary settings in innovation activities contribute to innovative learning (European Commission, 2013a). This recommendation was echoed in the responses from the students, which revealed that the interdisciplinary cooperation had contributed to creating better solutions. According to WHO;

*“Collaboration occurs when two or more individuals from different backgrounds with complementary skills interact to create a shared understanding that none had previously possessed or could have come to on their own”* (WHO 2010a, p. 36). In general, responses suggested that students had learned from each other and become more aware of core competences within their own profession. These findings are reflected in a number of studies showing that interdisciplinary education enhances understanding of one’s own professional role in addition to the role of other professions (Cusack and O’Donoghue, 2012, Derbyshire and Machin, 2011, Earland et al., 2011, Rogers, 2010, Furber et al., 2004). WHO identifies midwives as a distinct profession but also as part of a collaborative interdisciplinary team (WHO, 2010b). Wilhelmsson et al. (2009) have argued that respect for other professions’ role and knowledge promotes team responsibility and problem solving skills. Today an increasing number of professions are involved in a course of care. Health care professionals therefore need the ability to cooperate, when identifying problems and strategies for the treatment of patients (Wilhelmsson et al., 2009, Oandasan and Reeves, 2005). The fact that the innovation project had an interdisciplinary setup may positively affect the students’ ability and motivation to work in future shared work settings.

A surprising finding in the study was that students found project learning most relevant for their clinical practice. This finding was interesting because the project primarily sought to build innovative skills. According to Id-Korhonen et al. (2011) gender seems to influence whether students find innovation to have importance. Female students have been found to value their professional identity more than their

entrepreneurial identity. As all project participants were female, this may explain the students' preference of the projects relevance for professional practice.

It had also been anticipated, that students would find their experiences of reviewing literature and collecting empirical data relevant for other types of academic activities for example thesis writing. However, the research and identification of target group needs was primarily perceived by students as having significance for their clinical practice. According to the students, the innovative phase of the project allowed them to work with practice-oriented solutions. As a result, they became more aware of the 'user's perspective' and why this approach was important. This indicates that innovative learning may have additional benefits such as promoting reflection relevant for clinical practice.

The cooperation with external partners was perceived to have both advantages and disadvantages. However, more advantages were reported than disadvantages. According to some of the students, insufficient economical funding was perceived to inhibit the development of web portal products. At the same time, all 18 groups of students managed to transform their ideas into web portal solutions. Gurül and Atsan (2006) have found that entrepreneurially inclined students have a higher internal locus of control and a higher need for achievement than non-inclined students. The fact that all groups managed to complete the innovation process, suggests that the students were successful in building action competence (Kromann-Andersen and Jensen, 2009). Student responses also indicated that the partnership with the regional hospital had increased their motivation to participate in the project

significantly. This finding mirrors results from studies by Id-Korhonen et al., (2011) and Hänti et al. (2008) concluding that real-life innovation projects with external partners are more efficient in promoting innovative learning than innovation projects situated solely within the educational context.

#### Study limitations and future research

There are a number of limitations to the findings in this study. The researcher was responsible for the overall project. Although the researcher was not directly involved in mentoring the students, it cannot be ruled out that this may have affected student responses. Furthermore data was coded by one researcher. Malterud (2001) notes, that when data is coded by one researcher, the researcher will need a strategy for broad data reading. In the study, data was read according to the six phases of thematic data analysis (Braun and Clarke, 2006).

In addition, the study was situated within the context of a specific innovation project. The size of the group of informants was small, all the respondents were female and project participation was voluntary. This may affect external study validity (Malterud, 2001). At the same time, a number of findings within this study do resonate with findings from other studies. Studies on innovation and entrepreneurship education as well as studies on problem based learning, collaborative learning and interprofessional education have previously presented related findings.

Study findings indicate how students perceived their participation in an innovation project as part of their health education. The political objective of integrating

innovation into existing health education curriculums, is to educate health professionals to be innovative upon completion of their education (Danish government, 2012). Larger scale research is needed to track long term effects of innovative learning including midwifery graduates ability to contribute to new solutions and professional development within midwifery practice.

### CONCLUSIONS

This study has highlighted various aspects of students' perceptions of participating in a real-life innovation project. Findings show that the students distinguished between lecturer led activities and self-directed innovation. Although self-direction by some students was perceived to be demanding, students also valued the autonomy they were appointed during the innovation process. Being supported by a mentor was considered to be of key importance. The mentor was needed to facilitate the innovation process, share expertise and provide student feedback. Findings suggested innovation was promoted by student team work. The interdisciplinary project setting seemed to enhance student awareness of their professional identity. In addition, the interdisciplinary setting was believed to improve the quality of the solutions the students produced.

Study findings showed that students found project learning to be most relevant for their clinical practice. Working with a user perspective seemed to lead to increased insight into the needs of women in antenatal care. Restraints due to lack of economic resources was to some extent believed to inhibit innovation. Despite these restrictions, all 18 groups transformed their ideas into web portal solutions. The



hospital partnership was also considered to play a major role in motivating the students' project participation. This was due to the fact that the students' solutions would be put into use and potentially benefit real-world hospital practice.

A number of limitations are connected to the findings. However, it is hoped that this study can inform future innovative learning activities and add evidence to innovation being a beneficial learning approach.

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