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Student peer mentoring in an entrepreneurship course

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Abstract

Innovation and entrepreneurship are two important drivers for growth, productivity and to welfare development. Companies, organizations, and governments increasingly focus on these topics, and academia has a central role in the Triple helix. Entrepreneurship education is considered an important contributor towards beforementioned goals. Active- and experiential learning has proven a wide range of benefits in entrepreneurship education, with more guidance. Student peer mentoring is regarded as an effective intervention to establish goal-oriented success and retention of students. By combining these two concepts, we try to create an educational setting for effective "real life" entrepreneurial learning through projects. The aim of this paper is to (1) Briefly describe the pedagogical design and the project introducing student peer mentoring in an entrepreneurship course; and (2) Study students' experience and the change in academic results introducing student peer mentor services. This paper has an explorative design, and we conduct a comparative case study. The course is ING101 Technology Management, Economics, and Innovation (ING101) at Western Norway University for Applied Science (HVL). ING101 is for non-business students at the undergraduate level. The main tasks for student peer mentors are to facilitate student's team-processes and academic work with a demanding semester-assignment where they create a business plan. Using student peer mentors in ING101 shows results. Firstly, students monitored by the student mentors, covers a role the lecturer does not cover due to (1) Age difference, and (2) Lecturer will grade the students and students may be reluctant to ask questions. Secondly, the use of student peer mentors has resulted in decreased reported workload and increased mastery. Thirdly, the average grade performance seems to have improved. These findings may be helpful for future empirical studies of mentoring in entrepreneurship education and serve as a guide for other who experiment and implement different mentoring styles in innovation and entrepreneurship courses.

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1. Introduction

Innovation and entrepreneurship are two important drivers for growth, productivity and to welfare development. Companies, organizations, and governments increasingly focus on these topics, and academia has a central role in the Triple helix. Entrepreneurship education is considered an important contributor towards beforementioned goals. In higher education learning activities to acquire skills and knowledge are an important topic and specifically in innovation and entrepreneurship courses where many scholars have asked whether entrepreneurship can be taught? At Western Norway University of Applied Sciences (HVL), we teach and develop the course ING101 Technology Management, Economics, and Innovation (ING101) and are doing research in innovation, entrepreneurship, and entrepreneurial pedagogy.

In this paper we explore effective learning techniques and experiential learning methods focusing on student participation and student peer mentoring. Two theoretical angels have been chosen: (1) Effective learning methods based on active learning and educational psychology; and (2) Experiential problem-based learning in entrepreneurship education included student peer mentoring.

Active learning methods has broad support and challenges the traditional lecture [1]. The traditional lecture, where students primarily listen and take notes, has for almost one thousand years been the prevailing form of teaching in higher education [2]. Traditional lecture is increasingly challenged by different active teaching methods, where students are active and engaged in the learning and use substantial part of the teaching time on tasks that require them to actively find information to answer questions and solve problems together with fellow students [1-2]. Numerous studies document that different active learning methods provide better educational results than the traditional lecture [2-3].

Effective learning techniques based on educational psychology are relevant with respect to how courses are designed, and the way students are challenged to achieve their learning goals. Ref. [4] find that "distributed practice" by spreading learning over time and "practice testing" provide significantly better learning than the other techniques examined. Distributed practice states students are better off by spreading out the study of content, instead of using the popular camming strategy.

Experiential learning is a hands-on approach to learning that moves away from the traditional lecture with the teacher in front transferring knowledge to students. It moves beyond the classroom and tries to give a more student involved way of learning, like problem-based projects assignments routed in 'real-world' problems exposing the students for uncertainty and ambiguity [5].

Ref. [6] suggests experiential teaching should replace more traditional methods and describes a new paradigm for entrepreneurship education and claims that teaching and training in entrepreneurship today must be made more unconventional in content, method selection and grading. The new paradigm give students opportunities to expand their insight through four approaches: (1) Theory-practice emphasis: The new paradigm stresses the importance of the relationship between theory and practice, and encourages students' learning experiences outside the educational institution (2) Co-participation in knowledge creation, instructor as facilitator: The new approach involves co-participation in knowledge creation, in the sense that the professor transforms to a facilitator and motivator through various learning methods (3) Multi-delivery approach: The new paradigm advocates multidisciplinary and a variety of learning methods, and learning takes place in various arenas, also cross borders. Learning is both inductive and deductive, in the sense that students learn about entrepreneurship and how to perform entrepreneurship through tasks; and (4) Both deductive and inductive learning to achieve sustainable knowledge. To use the theoretical knowledge, students must have the opportunity doing practical challenges. In this way, the student will not only be able to use the theory-based knowledge, but also formulate and create innovative solutions.

There is a close relationship between experiential learning and the so-called Action-Based Entrepreneurial Education (ABEE). In ABEE more action-oriented teaching methods are used with more focus on learning by doing

and supervision and less traditional teaching in classroom [7]. In [5] new venture planning (NVP) pedagogy is considered experiential learning, due to its design executing the four stages in Kolb's model (conceptualization, experimentation, experience, and reflection). NVP is also a subset of ABEE, and consists of four generic phases [8], see figure 1.
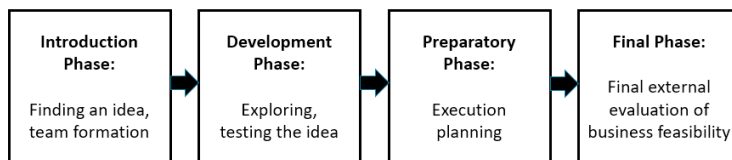

Fig.1. A generic model for a New Venture Planning (NVP) course [8].

According to the new paradigm in entrepreneurship education described above students can take ownership of their own learning [6]. The argument for this is that knowledge about entrepreneurship and innovation is largely silent, and it will depend on "experiential learning" approaches that require more guidance and less traditional teaching [6]. Student *peer mentoring* is an active learning approach with more guidance and is in higher education regarded as an effective intervention to ensure performance success and retention of vulnerable students [9]. We use the following definition based on [10]: *Peer mentoring is a helping relationship in which two individuals of similar age and experience come together, either informally or through formal mentoring schemes, in the pursuit of fulfilling some combination of functions that are career-related (e.g., information sharing, career strategizing) and psychosocial (e.g., confirmation, emotional support, personal feedback, friendship).* Student peer mentoring is based on the traditional mentoring model, in which an older, more experienced person serves one of two main functions. The concept of peer mentoring differs from classical mentoring in two aspects (1) Peer mentors and mentees are close in age, experience, educational level, and (2) They may also overlap in their personal identities, which are usually the criteria for matching [5].

Ref. [8] develop a model depicting four mentor roles in entrepreneurial mentoring dividing professional mentors and "student" mentors into: (1) "The role model" (2) "The expert" (3) "The learning facilitator" (4) "The coach". We were inspired by this work and found it helpful as a guide for implementing mentoring into our ING101 entrepreneurship course. Fall semester 2016 we decided to implement student peer mentoring based on the two beforementioned student-centered roles (3) and (4). Role (3) is process and student-centered and supports learning and facilitate the process through reflection. Like role (3), role (4) is also student-centered, but the approach is goal-orientation vs. process orientation through coaching.

2. Methodology

In this paper we build on two main theoretical concepts (1) Effective learning methods based on active learning and educational psychology; and (2) Experiential problem-based learning in entrepreneurship education included student peer mentoring. We conduct a comparative case study based on the course ING101. We look at the course conducted fall semester 2015 (hereafter Case 1) and secondly the course conducted fall semester 2016 (hereafter Case 2). Our case selection is based upon an "information-oriented approach" [11]. By this, we mean when the objective of the research is to obtain the greatest and most interesting type of information from a given phenomenon (here referring to mentoring in the domain of entrepreneurship education), a representative, average or typical case may not provide the richest information to the phenomenon of interest. Our goal is not to generalize, but to achieve a deeper understanding of student peer mentoring and to locate the peer mentoring models in our cases. Our data is primarily drawn from documents, meetings, notes, evaluation of students and professors in ING101. We have selected the same course and chosen two semesters that is quite similar in many ways. Table 1 make an overview of important dimensions of variations in the two different semesters. Student peer mentoring is what we want to study.

Case 1 and 2 have the same number of students, aproximately100, with the same engineering disciplinary and origin (chemistry, electronic and computer science). Further it is the same two professors giving the course. In table 1 we have presented some important dimensions to illustrate case 1 and case 2. In ING101 students are exposed to a problem, develop ideas, a business idea pitch, a business model and complete a business plan. Further description of the course will take place in part 3.

Table 1. Features of the two ING101 cases.

Dimension	Case 1	Case 2
Semester	Fall 2015	Fall 2016
Number of engineering students	121	100
Course requirements	Pre-test 1 & 2	Pre-test 1 & 2
Part delivery & feedback from mentors	No	Voluntary
Draft semester assignment & feedback	Mandatory	Mandatory
Student peer mentoring	No	Yes
Professors	2 (same)	2 (same)

The course ING101 has existed since fall 2013 but are built on accumulated experience with entrepreneurship education and other courses for more than ten years. The data forming the basis of ING101 originating from: (1) network seminars within mentoring together with several Norwegian Universities (NMBU, UiO and USN), (2) best-practice in the mentoring project from NMBU and USN and (3) from several meetings with information exchange between the authors/lecturer, departments, and students.

Since the objective is to explore how entrepreneurial peer mentoring can be interpreted and understood, a participatory involvement strategy is regarded as an essential condition for this study. It is therefore not necessary that the authors should be "objective" observers of the phenomenon, and we are aware of our role as participants rather than objective observers [11].

3. Case presentations and results

3.1. Case presentations - Course structure and pedagogical philosophy (case 1 and 2)

The course design of ING101 is inspired by active learning [1], distributed practice [4], experiential learning [5-8], NVP pedagogy [5-8], learning by doing [7] and explore and examine introduction of student peer mentoring services [9-10]. ING 101 is a mandatory 10-ECTS course for all engineer students at HVL in the bachelor program, 3rd to 6th semester. The learning outcome is how to transform problem and demands into business ideas, presenting it as an "elevator pitch" in front of a panel of investors and Technology Transfer Officers (TTO) and finally write a business plan. Students learn to apply innovative tools and to take a practical approach to writing a realistic business plan. Students work together in teams of 3 - 5 students. Figure 2 shows how the semester plan is designed for ING101.

Fig. 2. The structure in ING101 Technology Management, Economics, and Innovation (ING101).

Traditional lectures, individual- and group learning activities based on experiential learning principles are spread over the semester. The course contains of five modules and each module is uniform and has an equal structure with respect to combining traditional teaching, introducing theoretical concepts, student active tasks, digital platform, guidance, and support. Weekly tuition or meetings with students also have a uniform structure but with variety in topic. The uniform structure of modules and lectures of the course makes it easy for student and professors to monitor and keep on track. Student peer mentoring was introduced, in case 2, to the students during module 1 and hold on until module 4. The following sections will present ING101, common for case 1 and 2:

Module 1 Introduction: The course starts with a kick-off with an introduction to the different modules, assignment, and important days. The lectures itself is used to go through theory and examples, to prepare them for further teamwork. From the start of the course, the students are teamed up into project groups of 3 - 5 students. In this phase, the students are in an early stage of their projects and are in a process of selecting an idea. The professor's role is to

work with the team and facilitating this process and ensuring an optimal match between the student teams and chosen ideas.

Module 2 Business idea & Business Model: In the development stage of the business idea and model, the student team work independently between lectures often outside of the classroom. The teams are conducting small market research, as well as tests on real potential customers. This module ends with a course requirement, pre-test1 (ref. table 1), an assignment where the groups present: (1) their business idea, and (2) analyses of one stakeholder. It all ends up in a formal "Innovation-day" event, where students present their business ideas through an elevator pitch. An external venture panel with real-life experience in assessing business plans, consisting of advisors at the TTO (University technology transfer office) and Innovation Norway (National funding organization), is invited to evaluate the real market potential and realism of the business ideas. Several entrepreneurs give a lecture about their personal learning process and the story behind their venture success. After this day, all teams have had emotional exposure, expanded their ideas, and received expert advice along with valuable and updated feedback.

Module 3 Business planning: The students go in this stage of the project more in details with their business idea and search and define market segments and customer's needs. Furthermore, they estimate the financial forecasting, risk assessment and execution plans on how they recommend the idea to be realized in the marketplace. The professors function as a mentor helping the teams with tasks in the assignment, but also carefully facilitate the team process, as team conflict might arise as time pressure becomes evident. When considered necessary, the professors facilitate team process through individual team meetings.

Module 4 Daily business operations and executing: In this module the students go through common topics within daily operations, such as leadership, organization, project management, ethical theses, expansion, and exit- strategies. During module 4 students must fulfil the course requirement, pre-test2 (ref. table 1), several individually and groupwise tasks, to present him/herself for examination. Before finishing this module, the assignment called business plan, must be handed in. It counts 55% of the final grade. Part of the semester assignment, in addition to creating a business plan, is to do an individual reflection about practice like how the teamwork has been, the project from beginning to the end and their own contribution. Additionally, the teams must present the business plan to professors and people from the TTO and Innovation Norway. Feedback from the panel can be used to adjust the business plan before it has been submitted. This practice also prepares them for the individual exam.

Module 5 Summary and exam: The last module is to summarize the theory in the curriculum, get a deeper and broader understanding of theory linked to practical tasks done, tools used, experiential learning and practicing for individual exam. One test exam is also held to make the students more prepared for the final exam. This exam counts 45% of the final grade. The exam is digital, consisting of 50% multiple choice questions and 50% open-ended questions.

3.2. Case presentations – Student peer mentoring (case 2)

Student peer mentoring in higher education is usually conducted to develop social skills, academic skills, or both [8]. The use of student peer mentors in ING101 was introduced in fall semester 2016. Since the course was introduced in autumn semester 2013, it has demanded a great deal of monitoring of student groups. In fall semester 2016 there were 26 groups, 2 professors and 4 peer mentors. Peer mentor's role in this course has been twofold: (1) Follow up work on the assignments and mandatory submission (ref. table 1) and, (2) Follow up students regarding group composition, dynamics, and further progress. The assistance intends to contribute and help the students more easily perform tasks, get a better experience of learning within projects and innovation processes.

The student peer mentors are master students within innovation and entrepreneurship or have already completed the course. We had a small announcement on the intranet seeking for peer mentors. We received four applicants after a short time. The peer mentors did not complete a training course in entrepreneurial mentoring, due to lack of time, but are something we had planned for. Instead, we had a kick-off meeting where we went through the course, textbook and assignment and common problems from the earlier semesters. No time for training or go through a "to do list" so mostly we just had to give the peer mentors freedom and responsibility to take the job in their best way following the peer mentor's twofold role. How the teams were assigned to each peer mentors were easily done by the peer mentors' interests.

After finishing and evaluating fall semester 2016, both peer mentors and professors thought this had been a good way to organize the work for monitoring the teams. A shortly description of how peer mentors were used in the course is needed to understand how this role can replace parts of a professor's role, but also provide additional guidance to the student. The following sections briefly describes some of the main activities.

Module 1 Introduction: This first time using the student peer mentors, no official introduction was made, because of lack of time. This made it more difficult for the teams to start the process to ask student peer mentors for advice.

Module 2 Business idea & Business Model: In module 2 the student peer mentors should force the teams to plan for one meeting with them. This was high focus and achieved. This action made somehow a higher frequency of meetings or emails, communications between student peer mentors and team, but unfortunately the process started very late so the whole effect of introducing student peer mentors has not been achieved.

Module 3 Business planning: The frequency of mentoring was up to the teams and student peer mentors, but the course design has implemented student peer mentoring at all important milestones. Important milestones are part delivery related to developing a business plan (ref. table 1). The student peer mentors are asked to give feedback on parts of the assignment, often written. They are also consulted on a regular basis by the teams. To be able to learn from experiential learning, the student peer mentors facilitate reflection on different levels. The students have responsibility for the agenda and for bringing up important and particularly challenging issues in these meetings.

Module 4 Daily business operations and executing: Here the teams use the student peer mentors as an advisory role, by giving the team's advice on how to capitalize on team strengths, how to plan for accomplishing the final plan, how to present their business plan. Important milestones are drafted semester assignment (ref. table 1), and the student peer mentors are asked to give feedback together with the professors. Finally, the role of the student peer mentor is to coach the teams to perform the best, e.g., goal-oriented assistance and backing to maximize achievements (good grade).

Module 5 Summary and exam: In module 5 student peer mentoring is not used in ING101, due to finished teamwork (ref. 3.1 ING101 course description) and available resources in the end of the semester.

3.3. Results - Students' experience and reflections

Through several evaluations of the course ING101 like meetings with student representatives and reference groups, to offer student peer mentor service have been drawn in as a positive element. Firstly, students closely monitored by the student peer mentors covers a role lecturer does not cover due to (1) Age difference, and (2) Lecturers' natural function and students may be reluctant to ask questions due to upcoming grading. Second, the use of student peer mentors contributed to the decreased reported workload. This has also been discussed and mentioned in the Student Council meeting where student peer mentors were seen as a positive contribution. From the Student Council meeting (excerpt from the minutes): *"Students works in groups and have got a student peer mentor available. To have a student peer mentor for monitoring the team is great and positive elements. There is no feedback from the students on that there is too much work in the course this year. "*

This is the first time, after running the course for 7 semesters, that we have received no negative feedback that the students think it has been too laborious. This may indicate that student peer mentors have made a positive difference. There was also a final evaluation of the course, see eight excerpts in table 2 including students' experience with student peer mentoring service.

Table 2. Excerpts from students' final evaluation of ING101 Fall 2016 (case 2): Students' experience with student peer mentoring

Statement
... have helped us professionally with our assignment, quick and good ...
… This worked out great! has helped see understanding group dynamics
… straightforward to work with. Has come with various tips …have been great ...
Unbelievable! He had a lot of relevant knowledge which we took advantage of ...
Very good to have a mentor … guide and provide feedback throughout the project
… very helpful. He gave us lots of good advice and exactly what we asked for…
Student peer mentor has been very clever to "push" the students to ask for help ...

3.4. Results - Grade's results

We are always an interest in how students are performing. Has there been a change in the quality of teaching, teaching methods, moving more into active learning that have managed to improve students learning and average grade level? There are many factors that can disturb and change this picture so the real results we probably never will know. If we presuppose that the students are at the same level of qualifications and the curriculum, assignment and exam were similar, then there might be a degree of improvement in the performance, see figure 3.
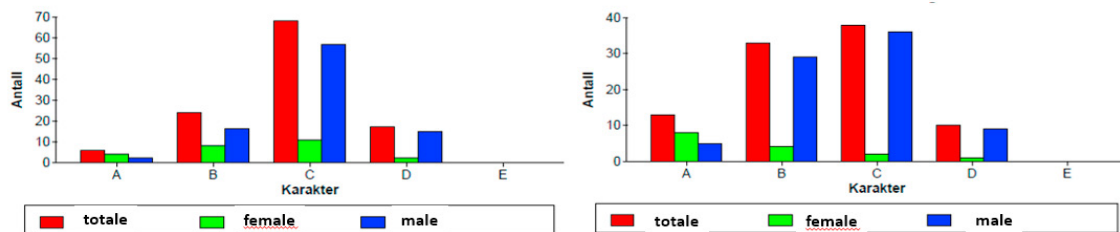

Fig. 3. (a) Grade's results case 1 (fall 2015); (b) Grade's results case 2 (fall 2016)

Comparing figure 3a and 3b more students got grade A. There is also an increasing share of male getting an A and B. Table 3 shows the average level of grades, total, female and male and there has been a positive trend in the average total level which has increased from an C to an B.

Table 3. Average grades case 1 (fall 2015) and case 2 (fall 2016)

Semester	Average total	Average female	Average male
Fall 2015	C	B	C
Fall 2016	B	B	C

4. Discussion

We find it essential to ask questions about course design, content, and teaching methods in entrepreneurship education. Our course design and learning activities should contribute to more effective learning and built more on evidence and less on tradition. A useful result from documenting the course design by looking into two different theoretical angels, is the similarity between effective learning methods like "distributed practice" rooted in educational psychology [4] and the NVP pedagogy associated with experiential problem-based learning in entrepreneurship education, ref [5, 7, 8]. Furthermore, we consider that the experiential entrepreneurship education methods [5-8] have clear similarities and can be described as a subset of active learning methods [1-2]. In practice we can distinguish between traditional and active learning methods and see the importance of a wide selection of "experiential learning" approaches [6].

Regarding the active learning and teaching methods that have been practiced, only student peer mentoring is a new element fall semester 2016 (case 2). Based on results from this explorative research it seems clearly that the use of more guidance introducing student peer mentors generate positive effects on students learning process. From our results we can also imply the dual function of student peer mentoring, supporting the team process [8]. Entrepreneurship courses like ING101 depends on an eco-system of cooperation and networking between students, student peer mentors and professors, require lots of coordination and a different professor role [6].

We reflect on what works well and less well throughout the fall semester 2016 (case2), and to what extent the objectives of the development of knowledge, skills and general competence outlined including the National Qualifications Framework were achieved. What can be improved? On idea is to facilitate or include even more experiential entrepreneurial learning outside the auditorium inspired by ref. [6], by offering more student peer

mentoring in for example module 1. This will need acceptance for and especially more resources from our faculty to use more student peer mentor. An interesting ide might be to test using business mentors in the ING101 course [8] in combination with student peer mentors.

We see that this study has some clear limitations, because it is performed with preferably a professor- and student perspective. Student perspective has come through reference groups, mid-term evaluation, but then further interpreted by us professors. In addition, the fall semester of 2016 entered two elements of which may have made a positive difference: (1) The instruction has been carried out over 6 hours one day a week, instead of 3 hours twice a week, and (2) New textbook.

5. Conclusion

We see from the discussion in Section 4 that it is natural to ask questions about how this knowledge can be used strategically to improve courses in innovation and entrepreneurship. Furthermore, how to coordinate and utilize the student peer mentor resource even better. We claim that this study gives signals that there been a change in the quality of teaching, teaching methods, moving more to active learning that might have managed to improve students' performance by performing better semester assignments and hopefully learned more. Mentoring programs are dependent on the support and cooperation of several actors in the regional environment and requires a high degree of internal coordination at faculty and organization among professors. Thus, a strong culture of cooperation and community practices is key to promoting advanced teaching methods guidance. In this context, we hope that this article can serve as a source of a common language that allows teachers, practitioners, and researchers to understand, interpret and implement student peer mentor systems and effective experiential learning models in entrepreneurship courses.

These findings have important implications for the further development of the courses ING101 and other innovation and entrepreneurship courses at HVL. In closing, we also hope that this article provides guidance and insight to stakeholders in higher education. It is critical that we continue to do research on student peer mentoring and other innovative methods of learning, so we better can understand the most effective means of supporting the career-related and psychosocial needs of future graduates. Applying student peer mentors in combination with lecturers acting as a facilitator during a semester course working with real world problems, can make the students more motivated and employable.

Acknowledgements

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