

The Impact of IT Bootcamp on Student Learning - Experience from ICT Enabled Experiential-Based Course

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Abstract. We have been teaching an experiential-based course for first year master students. In the last two years, we have added to the course external activities such as Hackathon and Bootcamp. These external activities helped students internalize how important are soft skills and involvement of external stakeholders to succeed in developing relevant startup projects. This year, we wanted to evaluate if students were getting what we declared. We conducted a survey on students perception of different dimensions: soft skills challenges (teamwork, communication with stakeholders, presentation, negotiation, and innovation), technical challenges and project management (PM) challenges, before and at the end of the Bootcamp days. We found out that the mean values regarding soft skill challenges and project management vary, while values regarding technical challenge have not changed before and after Bootcamp. The overall outcomes of the study contribute to conceptualizing an early model integrating student startup formation with course learning outcomes.

Keywords: Bootcamp · Experiential course · Soft skills · Technical challenges · External stakeholders

1 Introduction

The concern of the skill gap between students and industry expectations has repeatedly been raised during the years [10]. Universities have tried to increase student readiness and fulfill industry requirements [6]. To this end, different approaches have been adopted to tackle technical and soft skills, mainly relying on capstone courses [5]. In these cases, student projects adopt the idea of prototyping through industry customer-driven [1], startup-driven [2, 3], innovation and creativity-driven [4]. All these team-based project courses have provided an adequate challenge for students to get acquainted with industry-related technical and soft skills, primarily because of the involvement of external stakeholders.

A strong emphasis is also put on inter- and multi-disciplinary teams in innovative courses [7, 9], through experiential learning [8].

we incorporated external activities to our course to provide students a concrete learning outcome: to emphasize how important are technical skills, soft

skills, and exposure to external stakeholders to succeed in developing relevant projects. To this end, we formulated the following research question (RQ):

RQ: *What skills can students gain from external stakeholders within an experiential-based course?*

To address the RQ, we designed a survey that consisted on asking each team to grade the initial and final value of dimensions related to soft skills (teamwork, communication, presentation, negotiation, and innovation), project management, technical challenges concerning the Bootcamp activity and involvement of external stakeholders. Teams provided the initial values after the stakeholders presented them with their challenges in Bootcamp Day 1. Final values were provided at the end of the project final draft delivery ready to be pitched, Bootcamp Day 2. Within the course scope, these two Bootcamp Days occurred with a distance of 40 calendar days. The goal was to evaluate the variance of these two measurements and assess which dimensions have changed.

We found that the perceived value of soft skills and project management dimensions being a challenge towards delivering the final project varied after the Bootcamp. However, we did not notice any variance in technical skills. This is also justified from the fact that there was little input either from the course instructors or the stakeholders in this regard, due to the experiential learning nature of the course. We propose a conceptual model to be adopted and further evaluated in the future. Furthermore, students have gained practical experience in forming startups with multi-disciplinary teams.

2 The course and Bootcamp settings

2.1 The course and student teams

Our course is based on the experiential learning approach [8]. A total of 21 students have participated in the course. Demographics show that the ration among female and male students is 52%/48%. Whereas, the age distribution primarily varies between 18-30 composing 95% of the students and only 5% being above 30 years old. Teams are commonly composed of students having different study background. The main character is the inter and multidisciplinary composition of each team. Every team makes an effort to come up with an innovative idea. Team composition is decided from the course leader before the start of the course, taking into account discipline and gender balance. The team size varies from 5 to 7 students at most. Self-structuring is common, and each team is required to apply group process theory, when coping with challenges and improving team dynamics.

2.2 The Bootcamp and external stakeholders

The Bootcamp represents a three one-day event organized during the semester. It motivates students to develop relevant solutions and business concepts through Minimum Viable Product (MVP) prototypes, which can be field-tested during

and after the course, in realistic scenarios. Support is provided by the instructors and external stakeholders to help students develop their future startups. Students undergo several phases: (Phase 1) Practical exercises related to analogy thinking, brainstorming, idea selection, and solution proposal. (Phase 2) Focus on the idea development through lean methodology, prototyping, and business models. (Phase 3) Students learn how to pitch ideas, think international, and create future startups.

The external stakeholders participating in the Bootcamp are part of different sectors. Their role is to present a framework of practical social challenges, which can be tackled through information and communication technology (ICT) tools. Their participation in the Bootcamp days is key to the fostering of innovative ideas. We have tried to cover three crucial sectors (academia, government, and industry) when choosing stakeholders background.

3 Survey

Based on the **RQ: *What skills can students gain from external stakeholders within an experiential-based course?*** we guided our investigation. The survey involves questions regarding the Bootcamp external activity but with direct influence on the students learning outcome and performance. The investigation is performed based on a quantitative questionnaire where the same group receives the same treatment in different points in time. Dimensions considered for the investigation are grouped into soft skills (teamwork, communication, presentation, negotiation, and innovation) and technical skills (technical challenges, project management) acquired during the Bootcamp days.

3.1 Survey Design

Students are asked to answer the online questionnaires once after the initial Bootcamp presentation (Day 1) and after the first prototyping is developed (Day 2) based on MVP concept. Key dimensions related to technical, soft, and PM skills challenge perception are to be rated with a scale from 1 to 5. The calendar time difference between the two surveys is approximately 40 days. To minimize bias, the respondents do not have the answers from the first survey available during the second one.

3.2 Data Collection

We conducted the study during the spring semester 2019, where each of the four teams involving 21 students, chose to develop a project within the course theme. We noticed that all the projects are different in nature but with similar complexity. Project Hallo-Capeesh allows people to connect through a mobile application adopted from the original Capeesh language learning, mobile app. The project Sanku-Lions consists of a mobile application that can enhance the remote access of Sanku-Fortification. The Food-Waste projects tackle issues on

how to give use of food wasted by supermarkets and redistribute foodstuffs to the final consumer that are in this case, students. The B-Social tackles the challenges that internationals face when moving to Trondheim in terms of social integration. The solution proposed is an app prototype and survey. The initial and final perceived values of correctly addressing soft, technical skills and project management challenges can be found from the online surveys ¹.

3.3 Data Analysis

Since we didn't know what to expect from the investigation and the same group is taken into consideration, we analyzed the mean and variance of the obtained answers before and after Bootcamp and represented them in box plots, Figure 1

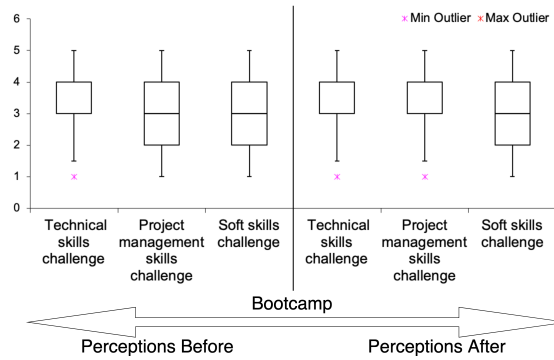


Fig. 1. Box plot distribution before and after Bootcamp activity.

Preliminary key findings are as follows:

1. **Technical Challenge.** The scope of the experiential learning approach is not to address the technical knowledge of the students. On the contrary, it relies on their previous technical knowledge. We would not expect a significant difference in this value neither after the Bootcamp or along the course, which eventually was true.
2. **Soft Skills Challenge.** This is the key knowledge acquired during the course setting; thus, we would hope that the Bootcamp contributes to this dimension significantly. We notice a slight dropping of this value.
3. **PM Challenge** Some of the students within the teams might have previous knowledge regarding project management acquired from other courses. However, the setting changes in the Bootcamp since they have to cope with inter-disciplinary teams. We notice a slight dropping of this value, especially for the minimal outlier.

¹ Survey results can be made available on request

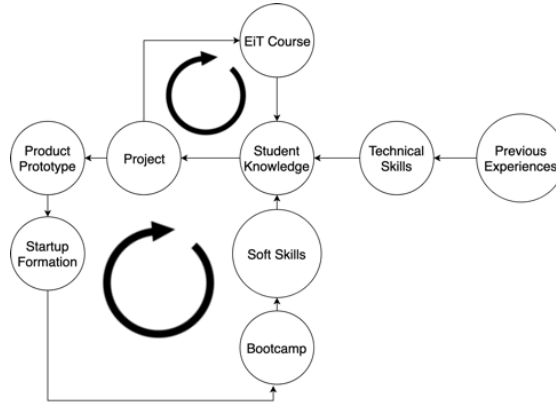


Fig. 2. Startup-driven experiential-based learning model for future courses.

4 Discussion

We are able after running the Bootcamp and analyzing the data to construct a conceptual model, Figure 2. In the model, we internalize the benefit of external activities. We can observe that the students base their technical skills on their previous experiences, and little or no influence comes from the stakeholders. Soft and PM skills, however, can vary influenced by external activities which require active collaboration with stakeholders. The final outcome could be to deliver relevant projects for the course or even contribute to startup formation, which can become part of future activities, thus creating a loop within the courses in future academic years. To, validate the model we still need to analyze the remaining data qualitative gathered from interviews and observations during the Bootcamp Days.

5 Conclusion and Future Work

We designed our course to allow students to interact with external stakeholders by conducting Bootcamp activities. We found that challenge perception of soft and PM skills varied before and after the collaboration with the external stakeholders during the Bootcamp Days. The technical challenge, however, remained the same since there was a little contribution in this dimension either from the course or from the Bootcamp activities. Based on the gathered data, we were able to propose a model to be validated from qualitative data already gathered and adopted in the future to the other similar courses. Our study leaves open questions that can be answered in future research. What is the potential of developing realistic products based on startup formation within the course? How can we involve further the stakeholders, and what are their motivations and challenges to actively collaborate with students?

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