

STUDENT'S JOURNEY AND PERSONAL DEVELOPMENT IN AN ENGINEERING PROGRAM

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ABSTRACT

Student's journey through the engineering educational program is academically demanding, and along the way, the student is required to develop professional interpersonal skills. To promote student's positive journey, the engineering program at Reykjavik University (RU) implemented an intense two-day event called Disaster Days, normally occurring in the fourth or fifth week into the first semester. In this event, students are challenged with a simulated disastrous situation where they have to face a sudden complex event that must be tackled in a single day. In this study, we used semi-structured interviews to ascertain to what extent the event affected the student's journey through the engineering program. Emerging clearly from these interviews with 15 students is that the students like this brief shift from the traditional individualistic learning environment, they value being confronted with group work with new people and that the event opens doors for a lasting social network. In particular, this experiential learning event has proved fruitful for developing the student's appreciation for group work. These interviews show that we can confidently conclude that this immersive short event provides a good start for the student's journey throughout the engineering program at RU and is arguably an important part of the curriculum to enhance interpersonal skills.

KEYWORDS

Student's journey, experiential learning, interpersonal skills, group work, integrated learning, student's well-being, networking, Standards 7, 8

INTRODUCTION

In the OECD framework for measuring well-being, education, skills, and social connections are part of eleven dimensions of well-being (OECD, 2015). This should guide educational work with the aim of offering students an environment that supports their well-being by emphasizing studying that offers time for socialization. Student's well-being is affected by many factors in the learning environment, such as the pedagogy employed, projects, learning material, and the structure of the study program. The social aspect of learning, like cooperation and relations with both teachers and fellow students, is also of importance. It has been well documented

that the first-year student experience is important for student's success, and in particular, students that develop a social network are more likely to succeed in their studies (Wilson, 2009; Kavanagh, Clark-Murphy and Wood, 2011).

In an effort to implement certain interpersonal development and improve student's well-being, the engineering program at RU has run a two-day intensive event early in the first semester of the program, called Disaster Days. The event is described to some extent later in this paper. The objective of our study is to ascertain if and then to what extent the two-day Disaster Days affects the student's journey through the engineering program, including teamwork, social network, and well-being. This was done by taking semi-structured interviews with students that had participated in the event, i.e., earlier in the same semester, one year earlier and two years earlier. Information obtained in this study can guide the faculty in developing Disaster Days further and strengthen the focus on students' well-being.

Experiential Learning

Pedagogically the authors place the event Disaster Days in the domain of experiential learning theory (ELT) where the student is educated by stimulating his intelligence based on learning by experience and reflection (Dewey, 1938). Another important driver for our implementation and development of Disaster Days is the CDIO learning model. The CDIO engineering education model emphasizes that students learn in the form of organic connection between active application and course participation. It emphasizes "learning by doing" with the whole process of the project life cycle as the carrier. Moreover, this learning model is intended to cultivate students' engineering ability, personal, professional morality, academic knowledge and the ability to use knowledge to solve problems by nurturing interpersonal skills (CDIO, 2019). It is necessary to emphasize group work and teamwork in engineering education as it is seen as a crucial ability at the company level as employers emphasize that engineers need good communication skills and be able to work well with co-workers (Lingard and Barkataki, 2011; Borrego, Karlin, McNair and Beddoes, 2013; Bergman et al., 2017). According to Duhigg (2016), it is not easy to find the best recipe for a "good" group, and he states, "In the best teams, members listen to one another and show sensitivity to feelings and needs." (Duhigg, np, 2016). In schools, good and successful work cannot be taken for granted, as there are many factors that influence the group work, e.g., transfer of knowledge, social support, attachment, and individual characteristics (Lavy, 2017). Experiential learning is part of the paradigm that shapes the education of engineering students in some universities. A noteworthy example is the participation of the authors in the Erasmus+ project Dahoy where several universities collaborate to establish a learning framework based on the experiential learning approach (Gaultier Le Bris et al., 2017).

Disaster Days

Disaster Days have been part of the engineering programs at Reykjavik University (RU) since 2011, now implemented as a two-day intensive course early in the first semester (Saemundsdottir, Matthiasdottir, Audunsson and Sævarsdottir, 2012; Audunsson, Fridgeirsson and Saemundsdottir, 2018). The purpose of the event has been to break up a long semester, enhance interpersonal skills, and provide an early opportunity for students to become acquainted with students in the same field of study. In this event, students are challenged with an unexpected simulated disastrous situation that must be tackled within teams and in a single day. The event is designed in such a way that the scenario awakens the students' interest, and teamwork appears as a natural way to tackle the situation.

Four or five weeks into the first semester, Disaster Days start on Wednesday afternoon with an hour of short lectures on teamwork and on the importance of being able to do back-of-the-envelope calculations. The same day students are put in groups, typically six students in each and from the same engineering discipline. Faculty members are involved, such that each one is a mentor for about five or six groups. Early on Thursday morning, all students gather in an auditorium, and the unexpected disaster is introduced as a dramatic short news bulletin video made in cooperation with a local TV station. This kick-off event gives the disaster and the task at hand a more realistic flavor and urgency. The scenario unfolds throughout the morning with several fresh news text bulletins to keep up the volatile and agile atmosphere. All Thursday, students work in teams, and at the end of the day, there is a short lecture on presentation methods. On Friday morning, the teams work on summarizing results and prepare for presenting their results to fellow students in the early afternoon. The presentations are run in often five parallel sessions, about seven teams in each, and take in total one hour. When the presentations are completed, the event is over. A more detailed description of Disaster Days can be found in Audunsson et al. (2018). Figure 1 shows one team in action.

The scenario presented to the students at the beginning of Disaster Days in fall 2019 was as follows: Breaking news - a very contiguous pandemic started out simultaneously in several of the world's largest cities, it spreads fast and has a very high fatality rate. The task was to design the first reaction in Iceland, how to isolate the island from the pandemic, possibly divide the country into several quarantine areas, and estimate if and how the nation could survive in isolation for possibly a few months. In the previous two years, 2017 and 2018, the events focused on sudden local volcanic eruptions.



Figure 1. One of the teams working during Disaster Days fall of 2017.

METHOD

A qualitative research approach was chosen, with semi-structured interviews and open questions. A qualitative research approach strives to explore and understand the meaning individuals or groups ascribe to a social or human problem. This method was believed to provide better insight and understating of student perceptions and experience of Disaster Days.

Participants

Interviews were conducted with engineering students that had taken part in Disaster Days. The students were selected randomly by asking them to participate when they were in class, so they are a convenience sampling drawn from the population that was close to hand. A total of 15 students participated, six males and nine females, and they were in their first, second, and third year of study for BSc in engineering (5 from each year).

Measures

Four open questions were used to guide the interview, but students were encouraged to describe their experience with their own words. We asked them to reflect on the event, and we left it completely up to them how and what they preferred to talk about. The questions were:

1. How did you experience Disaster Days? Not how the event was conducted, but more how it affected you.
2. Did you find Disaster Days affected your vision of engineering as a subject and on engineering work?
3. Tell me if your stay in RU changed after the event, e.g., social life, friends, cooperation, or well-being.
4. Anything else you would like to mention about the Disaster Days?

Procedure

The interview started with a short introduction to the purpose of the interview and asking for permission to record the audio of the interview. The students were asked to state their names, study lines, and a semester at the beginning of the recordings. Each interview lasted 5 to 10 minutes and took place in a quiet room provided by the authors. Two of the authors were present in all of the interviews, and the same person asked the questions in the same manner in all the interviews.

RESULTS AND DISCUSSION

Analyzing the perception and experiences of these students provided information that can guide both further development of engineering education at RU and be valuable to others who plan to implement the concept. Three themes emerged from the analysis of the interviews, as discussed in the following sections: 1) the enjoyment of breaking up the normal agenda, 2) the importance of teamwork, and 3) the benefit and pleasure of meeting and working with new people.

The Enjoyment of Breaking up the Normal Agenda

The first-year semester in university can be a tough learning experience, and as shown by Baker et al. (2007), this experience influences their decision to become engineers and Balakrishnan and Low (2016) emphasize the importance of providing students positive learning environment as it influences whether students will complete their study or not.

Almost every student stated early in the interview that participating in the event was truly enjoyable. The reason we emphasize truly is that the students iterated this one way or another during the interview and explained why. In addition, many students mentioned that solving the

open-ended assignment of Disaster Days and using their creativity was a welcome change from the normal course of study. They felt a bit of a relief to break up the normal course of study, sitting in lectures and the like, and have the opportunity to do something very different, and they were much more engaged in what they were doing. This is revealed in the following comments from three students:

"I found it very enjoyable, it's nice to do something else than just read books, and things like that"

"Yes, I here ... I felt this a nice change from here ... the first semester is kind of difficult, kind of a lot of stress at every stage. Good to break up that week and everyone was in a good mood... just satisfied"

"These two days I was one hundred percent engaged, totally different from normal lectures when I dropped out soon after the lecture started"

These comments by the students are in line with results from Murphy et al. (2006), that short icebreaker immersive events at the beginning of an introduction to engineering course were most popular among students, for their duration and that the students were removed from their usual learning environment.

The Importance of Teamwork

It was clear from the students' answers that they generally had a positive experience of teamwork and valued the experience of being confronted with working with new people. Several students mentioned that this was in contrast with their earlier experience in high school when they were used to work with their familiar classmates and friends. It was unexpected how often they mention how lucky they felt with the group members as if they had won the lottery and the benefit of friendly group members that would discuss and work well together from the first moment. Although experienced as a challenge by the students, this was considered a good learning experience and even the highlight of Disaster Days as these two students said:

"It was really fun to work in a group like this, and this was really the first time I worked with someone else, not just the one you chose but you were put in a group with someone you didn't know, and so on."

"...this was something different, got you to work in a group, chat together and ... but it also was difficult, you had to agree without necessarily agreeing, being able to reason without being dissatisfied. "

Group work is not always easy and can put a strain on the members, especially if they are not all motivated and ready for hard work. This was reflected also in students comments although most of them were satisfied they were not all happy with the experience of the group work as this student said:

"I sometimes have difficulty working in a group But I wanted to do this well, is just that, conscientious, but it wasn't necessarily a lot of interest in the group... they saw it more as an opportunity to have fun."

The students had preconceived notions of what engineering is about and they were quite confident that their study lays the groundwork for future professional life. Therefore, they considered it of great importance to be prepared for teamwork and be ready to work with people you do not know. This notion is stated in these comments:

"in the future you work in groups and you just have to learn and train for it"

"It's kind of weird at first to have to work with strangers, but it prepares you for what is to come, needs to be ready to work with everyone and to get started right away."

Although students believe they know what engineers do, they did often mention that Disaster Days strengthened and confirmed their idea of how engineers work, gave them better insight and they were quite happy to have the opportunity to train skills such as reasoning, debate and draw conclusions from the discussion within the team. Connection to real life is important, and Disaster Days are an opportunity for the students to work with open-ended projects that do not have one final solution like this comment presents:

"And also very nice that this was not too clear task, you had to decide for yourself how to do this ... we are just so used to getting an example to calculate, and know exactly how to do it, but this was kind of more open, and we got more to use our imagination"

The Benefit and Pleasure of Meeting and Working with New People

The students appreciated the opportunity to get to know new people, and they mentioned several reasons for this. One is that this was a splendid opportunity to meet students in their own field of study, that they made new friends that they were able to sit next to in lectures and greet them in the hallway. They also mentioned that the team would become a kind of support base, both socially and in their study, and formed an integral part of their study network. Also, having worked so personally with members of the team, somehow, they felt more comfortable in the study program. Students that did not know anyone when they started the program at RU stated that this event and the teamwork was very beneficial for them.

The students did not only get to know new people in their working group, but they also established a friendship during Disaster Days that lasted after the project finished, or as these students said:

"There I met 6 new people I can chat with and greet in the corridors. You made new friends and things like that. "

"And yet to this day we are good friends, it was fun getting to know more people in the course ... I greet all these people today, and I did not know them ... This was a great choice for me, it was the first group work project in college, but in high school, it was good for friends to work together in a group. So it was really fun to ... throw you in the deep pool and work with people you haven't worked with before. "

The event in Disaster Days is selected, and its unfolding is designed in such a way that it hopefully entices the students to get actively involved and that teamwork appears natural in solving the open-ended task, in part done by the urgency and relevance. Experiential learning, as used here, appears to be appropriate in learning and appreciating teamwork, and based on the interviews, the students may even reflect on their teamwork with fellow students long after the event. Although we chose to use the term Disaster Days for this event, some sort of VUCA-

type (Elkington, van der Steege and Moss Breen, 2017) of an event may work as well (Audunsson et al, 2018), something with urgency and which automatically leads to teamwork.

CONCLUSION

This event, Disaster Days, is in the spirit of CDIO's emphasis on integrated learning, different learning styles, and engagement. Although the event is only two days, the students were introduced to a relevant engineering task, which is designed such that it is best approached through teamwork.

The interviews with 15 students analyzed in this study were designed to probe the long term effect of Disaster Days, from two months to two years, including teamwork, companionship and well-being, and the student's journey in the engineering program.

Direct remarks in the interviews show clearly that the students value in particular the experience of teamwork. Although some of them mentioned that working in a group with new people was challenging, they felt it prepared them well for professional work. Secondly, the individuals they worked with so intensively in their teams frequently became, to some extent, their support base at school, both socially and as part of their study web, and hence the event helped most of the students to either build or enhance their social network. Thirdly, the enjoyment of breaking up the agenda of normal learning routine during the first semester and taking part in something new and unexpected, in this case, tackling a disaster as an engineering task, was mentioned by almost all the interviewed students. Reflecting on the event in the interviews almost always brought back some positive remarks. Based on these three themes, we are confident to conclude that the event provided a good start for the students' journey in the engineering program.

It is interesting to note that the students gave the same impression independent of if they had participated in the event only two months earlier, one year or two years. If this is significant and to what extent Disaster Days affect students in the long term, like after graduation, it is of interest and may call for further studies. It must be noted that although this study and several end-of-course evaluations by students seem to consolidate that Disaster Days have a positive impact, the results have not been tested for cognitive biases.

In short, placing a short, two-days, an event like Disaster Days early in the first semester in the engineering program provides a positive start for the students' journey for the upcoming years in their study, both for academic advancement and for interpersonal development and well-being.

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