

EXPERTS IN TEAMWORK: A MASTER COURSE FOSTERING STUDENT CREATIVITY FOR MAKING SNOWY MOUNTAINS SAFE

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ABSTRACT: The interdisciplinary course “Experts in Teamwork” (EiT) is mandatory for most master students at NTNU. The aim of the course is twofold, one is to develop interpersonal and interdisciplinary collaboration and communication skills and the other to tackle a project with real-life societal challenges. The students can choose topics from society or academia from more than a hundred “villages” consisting of one academic staff member covering the specific field, two student assistants and up to 30 students. In 2023 and 2024 we offered the village “Safe touring in winter mountains” (“Snøskred på liv og død”). In the EiT course groups of students from different study programs (from engineering to marketing, from biology to water resource management) develop a product within the topic of the village. The students learn team skills and to reflect on various group work situations. In 2023, the first time we offered the “avalanche village” for the EiT-course, one group developed a database to record avalanche accidents by the victims. The focus was on user-friendliness and providing a knowledge resource for the community. Another group developed an ingenious awareness campaign. In 2024, groups developed an inclinometer for skis; a push app to warn trespassers from entering run-out zones; a 3D touring map where the current avalanche warning of a planned trip is overlayed; a virtual game teaching basic snow factors; and a radio play combining pedagogical elements with entertainment. In other EiT villages ideas from the students have made it to the markets. Here, we present some of the ideas and projects from our students, and hope it stimulates further creativity and ingenious solutions to make traveling on snowy mountains safe.

KEYWORDS: avalanche education, interdisciplinary, virtual game, awareness campaign, radio play.

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1. INTRODUCTION

How can we make the mountains safe? Backcountry skiing and enjoying the snowy mountains has increased in the last years. Better equipment and accessibility of mountains allow more people to enjoy the fun of powder and scenic nature. The drawback is the risk of getting caught, injured or even killed by an avalanche. Avalanche forecasting services and courses offered by e.g., mountaineering organisations provide information and education for safe traveling in the winter mountains. A range of tools (apps) have been developed to assist the skiers on their trip and or foster understanding of avalanche risk. Still, what if “novices” with fresh eyes look at the problem, and try to find a solution? Let’s spark new ideas.

2. EXPERT IN TEAMWORK COURSE AT NTNU

At the Norwegian University of Science and Technology (NTNU) a compulsory Master’s level course is Experts in Teamwork (EiT), running every spring semester and worth 7.5 ECTS (1/4 of a semesters required credit points). The course is run for 15 full days, either as an intensive course for three weeks or as a semester long course one day a week.

Over 100 different “villages” or topics are provided, offering the students a choice by their interest (see [Experts in Teamwork - studies - NTNU](#)). The students’ preferences are considered when distributing the over 3000 students. This ensures that each village has around 30 students coming from different faculties at the university. The aim of the course is for students to acquire interpersonal collaboration and communication skills, working in teams and fulfilling an interdisciplinary project with societal relevance.

A secondary aim that has become more prominent in the last years is to foster innovation and solving societal issues. The village “Snøskred på liv og død” (“Safe touring in winter mountains») was offered in spring 2023 and spring 2024. We here briefly present some of the projects spearheaded by the students from the two years.

3. SPRING 2023

This was the first time the course was offered and neither the students nor the “village supervisor” (GP) were familiar with the course. A brief introduction to the challenges of backcountry skiing was provided. The five groups of 4-5 students each always had at least one student who actively engaged in backcountry skiing, with some having experience as tour guides and or had taken a recreational avalanche course. Two groups build on the idea of Toft et al. (2024) on counting how many people go in the mountains. One group reviewed the option to use blue-tooth and another one a simple registration application. This was connected to the Mountain code rule

#1: Plan your trip and inform others about the route you have selected” (DNT 2024, Gelter 2000).

3.1 *A database for registering accidents*

Avalanche warning services and rescue units often only know about severe accidents, but many smaller accidents and incidents are not reported. Still, these incidences are a great opportunity for learning, and would also help in estimating the hazard rate of avalanche incidents and accidents as too many get unreported. Based on an existing database to record climbing accidents or incidents, one group developed a database for avalanche incidents. A hallmark of the database was that it allowed an anonymous registration of the accident. The students piloted the user interface, and the software tool Figma was used. See figure 1 for a screenshot.

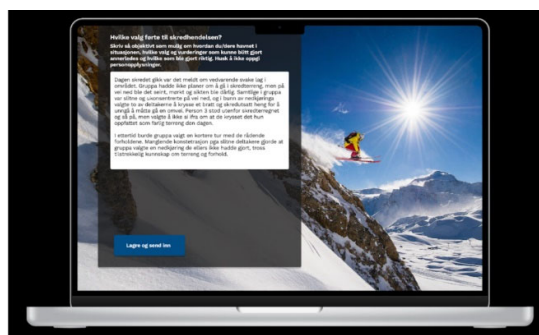


Figure 1: database for recording of near-accidents and incidents (in Norwegian). A dummy can be accessed here: <https://www.figma.com/proto/07kCuLACdKRLxVVhDpXO2y/Ulykkesskjema?node-id=16-3&scaling=scale-down&page-id=0%3A1&starting-point-node-id=16%3A3&show-proto-sidebar=1>

3.2 *Awareness campaign*

Research indicates that danger signs are not unnoticed but rather ignored (NordForsk, 2021). One group used this to strengthen speaking up and or discussing doubts about safety with group members. The group designed an information campaign, reviewing the type of users and related campaigns to e.g. increase the use of seat belts. Figure 2 provides two possible posters. The posters can also be distributed online.



Figure 2: two poster drafts by the student group. Left side: "On which side of the 30° are you?" Right side: "Are you in doubt, then you are not in doubt".

4. SPRING 2024

Given the feedback from the spring 2023 edition, the second edition of our EiT courses provided a more in-depth introduction to the topic. The first day (8h) was spent on taking the avalanche school provided by NVE (<https://www.varsom.no/snoskred/snoskred-skolen/>). It is an interactive course that does not at all replace a practical avalanche course but goes beyond the avalanche forecast. Nearly all modules were done together in class, and the students were encouraged to finish the modules to earn the certificate. Note, earning the certificate was not compulsory for passing the EiT course. A practical introduction covering snow stability and snow layers was given on day 2 by Håvard Engen, certified NF snow avalanche instructor. Due to the low precipitation in spring 2024, the scheduled outdoor day at a popular nearby ski center (Vassfjellet) could not be run as no avalanche problem could be studied.

There were again five groups. One group tried a gamification of avalanche education, embedding some drone footages and or 360 degrees videos into a web survey that were kindly provided by the Center for Avalanche Research and Education (CARE, UiT the Arctic University of Norway). Another group sketched an app that warns when one enters avalanche terrain. They discussed the frequency of warning and whether it should be connected to the forecast or not. Three other projects are described below.

4.1 An inclination device on your ski

A range of tools exist to measure inclination. However, taking out your smartphone or using your poles might be just enough of a hassle to prevent skiers from doing it (often enough). What if the information comes literally "on the go"? Why has nobody(?) placed an inclination device on the skis? One group

designed a device, noticing the challenges of weight and lacking the time to test it thoroughly outdoors. However, the costs cannot be the reason why this solution of an inclination device is not yet on the market. All materials are cheap, and a user survey run by the students found out that most are willing to pay between 500 to 1000 NOK (\$50 to \$100). Figure 3 below illustrates the prototype, lighting green if the inclination is below 25 degrees, yellow if between 26 and 30 degrees and red when above 30 degrees. There was no time left to develop it further, i.e., sending the signals to ski goggles.

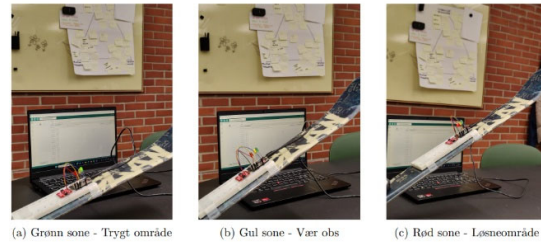


Figure 3: Practical demonstration of the inclinometer mounted on a ski. In this prototype diodes are used to signal the angle.

4.2 3D visualization of your planned trip with avalanche forecast superimposed

Despite large improvement in visualization tools, computer screens are 2D. FatMap is a website that provides 3D maps. To facilitate where one is most exposed to avalanche risk, some users may benefit from uploading a gpx track of the planned route and check it against the avalanche terrain exposure scale (ATES, Statham and Campell, 2024, Larsen et al. 2020) and superimposed forecasted avalanche problems. The group called their app "TrailSafe", and a sketch can be seen in figure 4. As for e.g., skitouringuru (Schmudlach & Köhler, 2016, Schmudlach 2024) and a Norwegian version Topptur.guide the group emphasized that it is a planning device and should not be relied on blindly.

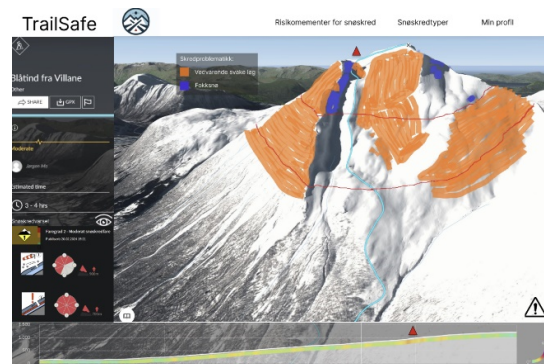


Figure 4: Screenshot of the TrailSafe app. App only sketched, not developed further yet.

4.3 *A radio play*

How do you teach the soft skills? Many accidents are due to the human factor, i.e., communication challenges among group members and cognitive biases that hamper good decision-making (Furman et al., 2010; Mannberg et al., 2018). One group set out to address this by staging backcountry trips. They wrote a script for a radio play and recorded it at NTNU's podcast studio. The characters used are some they are familiar with themselves, exaggerating them to highlight the stereotypical. The aim is to engage the listener and reflect about the human factors. Not least as avalanche courses rarely teach the social component but is known by backcountry skiers, recreationists and experts alike, to play an essential role (e.g. Dassler et al., 2024, Landrø et al., 2020). Listening to the play might spark a discussion about the goals of the tour and talk openly about one's mindset of the tour for each group member, and hopefully raise awareness of the risk of backcountry skiing.

An excerpt of the radio play (in Norwegian) can be listened to at: https://drive.google.com/file/d/1IVFW28WNjkSEP-WbS1slTP8nVPggGyg8/view?usp=drive_link.

5. DISCUSSION

The course aims to prepare students for (non-academic) work life by teaching them essential skills of teamwork and interpersonal communication skills. Over 15 full days the students work on a single project in a team composed of students they do not know from before and from another study program – sometimes something related but we try to provide diverse groups, not just by study topic, but also by gender and ethnicity. The students shall challenge themselves and by that also learn about themselves. A hallmark of the course is to foster the creativity of the students to provide new views and solutions to local / regional as well as global societal problems. EiT projects can be in collaboration with companies or public sector organisations. In the project “Safe touring in winter mountains” the goal was not a finished product. We encouraged going wild, offered time for brainstorming and to interact with members from the backcountry community. All student groups contacted relevant personnel, be it staff from the Norwegian trekking organization (DNT), the Red Cross, Norwegian Water and Energy resource department (NVE), Center for Avalanche Research and Education (CARE) and many more. The advice given by those people and the discussions shaped the students' projects. We emphasized that project ideas or prototypes would suffice.

We recommend the layout of the course, as it combined with the topic, can foster new ideas in increasing the safety in the mountains. Feedback from the students was positive. They enjoyed working on a

real-world problem that most were familiar with in their leisure time.

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