

THESIS

Avalanche and Winter Safety Course

Development project: Pyhä Ski School

Jasu Korhonen

Bachelor's degree in Adventure and Outdoor Education

(210 ECTS)

4/2021

ABSTRACT

Humak University of Applied Sciences

Bachelor's Degree in Adventure and Outdoor Education, 210 ECTS

Authors: Jasu Korhonen

Title of thesis: Avalanche and Winter Safety Course, Development project: Pyhä Ski School

Number of pages: 35 and 7 pages of appendices

Supervisor(s) of the thesis: Senior Lecturer Kai Lehtonen

Commissioned by: Pyhä Ski School

The purpose of this thesis was to develop an avalanche and winter safety course for winter hikers. In this thesis, the winter hikers are defined as anyone who is travelling in the backcountry without avalanche safety gear. The development consisted of literature on avalanche and winter safety and a research to define the needs for winter hikers.

The thesis was commissioned by Pyhä Ski School snow safety department. It aims to improve safety in the area by doing the avalanche safety forecasts and educating the visitors and local organizations concerning the avalanche safety. It is working around Pyhätunturi in Pyhä-Luosto National Park at Pelkosenniemi. The area offers great possibilities for any nature-based activity during winter and is popular within backcountry skiers that are seeking for steeper slopes to ride that are usually aware of avalanche hazards. But with the increase of snowshoers, fell skiers and other hikers it has been noted that they can also be at avalanche risk in some cases.

The development project was a practice-based that utilized some qualitative research methods. Theme-based interviews provided qualitative data that was used to define the course goals. The interviews were conducted with different organizations in the area to receive a wider perspective on the educational needs. The basics adventure education was also investigated to be used as a pedagogical method for the course.

The results showed that there is a demand for this basic course. It should be focused on avalanche safety without avalanche safety gear which involves terrain management to avoid the risks. In addition, there will be some relevant information on other winter safety hazards and good procedures on risk management for any trip. Experiential learning is widely used pedagogical method in adventure education, that will be used during this course.

During the process we developed a product that should be sold in the upcoming years by Pyhä Ski School. It consists of indoor and outdoor lesson that can be run by their instructors. It provides the participants relevant knowledge to be able to explore in the area more safely even independently. The results of this thesis are meant for Pyhä Ski School, but can also benefit many organisations working in similar environment.

Keywords: adventure education, adventure travel, avalanches, risk management, risk-taking behaviour, safety education, winter tourism

CONTENTS

ABSTRACT

1	INTRODUCTION	4
2	PYHÄ SKI SCHOOL	6
	2.1 Development needs	7
	2.2 Development project	8
3	AVALANCHE AND WINTER SAFETY	9
	3.1 Avalanches	10
	3.2 Avalanche risks	14
	3.3 Other winter hazards and risks	18
	3.4 Risk management	19
4	OUTDOOR ADVENTURES	23
	4.1 Stages of adventure	23
	4.2 Adventure and outdoor education	25
5	DEVELOPMENT AND RESEARCH METHODS	27
	5.1 Research methods	27
	5.2 Results and analysis	28
6	PRODUCTS	30
7	CONCLUSION	32
8	REFERENCES	33
	APPENDICES	36

1 INTRODUCTION

The nature-based travelling has been trending in the recent years and during the 2020 the visitors in the national parks has increased over 20% from the 2019. The visitors are usually seeking for remote destinations and silence of the nature. The amount of first timers is also increasing. (Metsähallitus, 2021d) It is a positive trend that people are going out into the nature, but it is also increasing concerns about safety of visitors. Metsähallitus is responsible of maintaining the national park and maintenance of the trails and structures. It is working together with other organizations in the area to increase safety awareness by reaching the visitors through different channels and giving guidance to the travel companies working in the area (Metsähallitus, 2020a).

This thesis is commissioned by Pyhä Ski School snow safety department. Their goals are to improve safety in the area by doing the avalanche safety forecasts and educating the customers and local organizations about the avalanche safety (Pyhä Ski School, 2020b). It is working around Pyhätunturi in the Pyhä-Luosto national park at Pelkosenniemi. The wonderful scenery can be easily reached by anyone within the park rules and everyman's rights. The area is famous of its authentic nature with steep fells and excellent backcountry skiing. But also, the possibilities for any winter activity are great in the area. It has versatile trail network for skiing, biking, and hiking during winter.

In this thesis, I will be studying the most concerning risks for winter hikers other than backcountry skiers who are traveling in the area without avalanche safety gear. That would include for example snowshoers, cross-country skiers, winter bikers, fell skiers and so on. For that, I will be investigating the literature and studies previously done about the topic and by organizing expert interviews. With that knowledge we will develop a new education system together with Pyhä Ski School which is more suitable for the winter hikers. The education should increase the physical and psychological safety of the participants by increasing the awareness and learning the fact-based information about the risks of the area. With that information the participants will be able to enjoy the surrounding nature more safely and independently.

Finland has its own avalanche education system, but it is only recently launched in 2017. So, the avalanche knowledge in Finland may be quite weak because of it and lack of higher mountains. Instead, there are rounded fells in Lapland that has snow avalanches in few places every

year, but risks may not be so visible as they are in a more mountainous terrain. Still, there are some close call situations and accidents every year in Finland as well.

The product of the thesis for Pyhä Ski School will be new avalanche and winter safety course that should be on sale in the upcoming years. That will include the content of the course and guide to the instructors with the required materials that are needed to run the program like presentation slides and safety documentations. It will assist their instructors to run the course so it can be adjusted to meet the needs of every customer.

2 PYHÄ SKI SCHOOL

The commissioner of the thesis is Pyhä Ski School that is working around Pyhä Ski Resort and is located at Pyhätunturi in the municipality of Pelkosenniemi in Finnish Lapland. It is a private owned company that offers education for alpine skiing, snowboarding, telemark, cross-country skiing. They are also organizing backcountry skiing trips, snow safety education and avalanche forecasting in the area (Pyhä Ski School, 2020a).

Pyhä Ski Resort is famous for the versatile freeriding possibilities that are suitable from beginners to more advanced riders and is advertised as a best place for freeriding in Finland (Pyhätunturi, 2017). It offers good areas for backcountry skiing close to the ski lifts, which means skiing away from the marked and serviced ski routes at the resort. The resort is located next to the Pyhä-Luosto National Park, which offers more areas for backcountry skiing that can be easily reached by skiing. Other than backcountry skiing possibilities, Pyhä-Luosto National Park has versatile opportunities for any nature-based activity. The area is advertised with a close proximity of the picturesque places with its deep gorges and fell tops that can be reached comfortably within a day from the resort centres. It has marked snowshoeing trails and maintained trails for winter biking, hiking, and skiing.

The national park is a broad and remote area with steep fells and gullies that has lots of potential avalanche terrain. The marked winter trails are avalanche safe for visitors, but there are also people moving off the trail in the avalanche terrain and with the suitable conditions they may put themselves at risk. To be able to explore safely in the backcountry independently, it is necessary to have the basic knowledge of avalanche and winter safety. For that reason, Pyhä Ski School is organizing avalanche safety education in the area that is based on the FINLAV avalanche education system. They also provide avalanche forecasts for the visitors with qualified avalanche technicians and instructors (Pyhä Ski School, 2020b).

FINLAV is national education system for avalanche safety in Finland. It was first created during 2015-2017 in a development project. The project was carried out with the help of Ostrobothnian Centre for Economic Development, Transport and Environment (ELY Centre) and the European Social Fund and was administered by Humak. It provided an education system called FINLAV. It is based on the Swedish avalanche training system SVELAV (Sveriges lavinutbildningar) which follows the international guidelines of the avalanche trainings. The education system is currently administrated by Finnish Ski Area Association together with the steering

committee. The committee has representatives from many different organizations that are working towards the avalanche safety. The education system promotes avalanche awareness, safety education and maintains the education material and educates the instructors in Finland. The education system is divided into two separate lines for the outdoor recreationist and for the professionals working in the field. The main target group is the backcountry skiers, but the program can be modified to any customer group. (FINLAV, 2017a)

The FINLAV education has increased the avalanche knowledge in Finland with many courses organized by different organizations around Fennoscandia since 2017 when the course system was introduced. But the issue with the current education in Pyhä Ski School is that it is currently highly focused on backcountry skiing and snowboarding, which may decrease the willingness for other visitors to apply for the snow safety courses.

At the same time, the amount of people other than backcountry skiers that are going into the nature and moving in the same areas is also increasing. As a winter hiker, it can be easy to ignore threats of an avalanches while moving on trails. Still, they can put themselves at similar risks if they end up in an avalanche terrain. The winter hikers are also generally travelling without avalanche safety gear, so the risk management and avoiding avalanches is even more important. The harsh weather during winter is also increasing other risks that may quickly lead into severe accidents if not taken seriously. There have also been some requests from other customers and organizations for new courses and materials more suitable for everyone.

2.1 Development needs

The avalanche knowledge may be quite limited for many in Finland since we do not have steep mountain regions and the risk of avalanches is not in our everyday lives and the education is quite limited on avalanches. But there are avalanches in some fell areas of Finland every year. If one end up in an avalanche it may quickly lead into a serious accident or even fatalities. Even some backcountry skiers may be a bit ignorant on the risks even though there are some close calls every year that does not always end up in public and some accidents that has required rescue operations in the recent years. The pictures and videos of wonderful skiing destinations and stunning sceneries in social media have increased the popularity of freeriding. That can highly affect the risk-taking behaviour within the less experienced riders, when they do not know the background avalanche safety work done behind the scenes. (Yle, 2021).

There was a safety report created by Metsähallitus Parks & Wildlife in 2020 that was ordered by the Ministry of the Environment with the concerns of consumer safety due to the increase of visitors in National Parks. The report stated some safety requirements in the services and guidance and some challenges and concerns of the visitors in the Lapland. For example, there were lack of knowledge by visitors, not being aware of the size of the area, lack of interest in getting pre-information and understanding route difficulties. Inexperienced hikers with lack of necessary equipment, not having enough food and improper clothing. The risk-taking behaviour has increased, and people are moving in avalanche terrain and crossing wide rivers with high risk. Even though there are some concerns, the report stated that the safety and risk management within the national parks is in good state. At the same time the report indicated some change of the customer base, so the trends should be considered. (Metsähallitus, 2020a).

2.2 Development project

During this project I will be studying what is a relevant safety knowledge for the winter hikers. With the help of my studies in adventure and outdoor education and knowledge of avalanche safety we will start developing new course for the ski school. Quite often, the backcountry skiers and snowboarders are seeking for steeper slopes for better rides that could be potential avalanche terrain where it requires lots of knowledge to be safe. The winter hikers are usually exploring in a little bit gentler terrain without avalanche gear, but that does not always mean that you are safe from avalanches (Wowk, 2021). Even though the risk of avalanches is quite low in Finland one may easily end up in an avalanche terrain. If the one cannot recognise what is safe in the area, it can also highly increase the psychological risk of not knowing about what is safe which can increase anxiety and make the trip unpleasant.

In the following chapters I will open the theory and methods and the basic knowledge of avalanche and winter safety that will be used in creating the new course. It includes some materials from the FINLAV education system together with outdoor lessons that are suitable for everyone. The goal is to create a course that will have enough information to be safe in the surrounding nature and increase the awareness of the risks. The participants will also have the tools to seek for more information or courses, if they want to explore in more demanding terrain.

3 AVALANCHE AND WINTER SAFETY

No environment is absolutely safe, and people are risk takers and make decisions to participate in activities for which they judge the risks to be acceptable. In that case, the safety is defined as a freedom of unacceptable risk, when the likelihood of an undesired incident occurring, and the severity of its outcome are acceptable. The risk is a measure of likelihood of hazard related incident and severity of a harm and damage it can cause. Hazards are defined as a potential source for harm or damage to people, property, or the environment. (Manuele, 2013). If the winter hiker is unaware of the hazards, they cannot be afraid and make justified decisions of acceptable level of risk.

The safety can be objective when there is no discrimination between the participants and the risk is same for everyone affected. It can be measured by statistics, like an avalanche accident when everyone is standing on the avalanche path. But it can also be subjective, which is much more difficult to define, and it affects everyone differently. For example, more experienced skiers may be concerned about the heightened risk of avalanche and less confident can panic by the difficulty of the descent on the same slope. (Hodgson & Berry, 2011, p. 49)

In this chapter, I will investigate hazards during winter and risks that it may produce. I will study the risk-taking behaviour of the winter hikers, snowshoers, or other visitors to the backcountry skiers or snowboarders. The risk-taking behaviour may be quite different and acceptable risk can be higher and must be taken in account in creating a relevant course for others. The goal is not to frighten the people about the risks of the backcountry, but to increase the awareness and knowledge of hazards. So, everyone would be able to make their own judgement on the acceptable risks and enjoy the wilderness more safely.

I will be using the literature and information from the professional interviews about the general winter and avalanche hazards and the theories of risk management in outdoors together with own expertise and the professionals working for the Pyhä Ski School. The tools for managing the risks will be presented and the data will be later used in creating a new course for the ski school that will meet the required safety standards in Finland.

3.1 Avalanches

Simplified, an avalanche is just a snow mass sliding down a slope by the effect of gravity, but it requires a steep enough slope, a vulnerable snowpack, and a trigger to launch. It is a natural hazard everywhere in the world if there is enough snow and a slope that is larger than 10 m x 10 m and steeper than 25°, it may be able to create an avalanche that is dangerous to human (Avalanche Canada, 2021). But to be able to predict the conditions where and when it is able to form it requires lots of information and experience. Even the experts in the field cannot be 100 percent confident when it can happen. Being caught by an avalanche can cause injuries and deaths. It can also affect the winter tourism in the area with bad reputation. The fear of avalanches can additionally cause anxiety on people (David & Schaerer, 2008, p. 14). For those reasons, an avalanche education and awareness are important for everyone also in Pyhätunturi.

The backcountry skiers are seen as the highest risk group at Pyhätunturi, because they are seeking for steep slopes to ride. But also, winter hikers can set themselves at risk on flat ground if they are moving next to an avalanche terrain. Especially the flat ground below the steep slopes and gorges can be seen as safe, but those are potential to launch avalanches in certain conditions. There are also marked summer trails going through gorges and tracks in avalanche terrain during the winter that can enhance the presumption of safety. But people are sometimes walking there with just blind luck without even knowing of the hazards of the area. If being hit and buried by an avalanche without any avalanche safety gear the probability of surviving very low.

To be able to educate about the risks of avalanches it is necessary to understand the basics of avalanches and terrain it requires to trigger. The avalanches are generally categorized into two types by their formation and trigger mechanisms and are called dry slab avalanches and loose snow avalanches. Dry slab avalanche requires a weak layer buried inside the snowpack that is causing avalanche to trigger. As a result, a block of snow is released that starts to slide down on a bed surface by the gravity. Loose snow avalanches start at a single point and spread out as they gather more snow on the way down. (David & Schaerer, 2008). The type of an avalanche can be determined by the shape of the avalanche fracture point and the area as in Image 1. It should be noted that there are also other types of avalanches like wet slab avalanches, slush avalanches, roof avalanches and glide avalanches. But those may be just briefly mentioned during the course since they are not relevant hazards for winter hikers in Pyhä area.

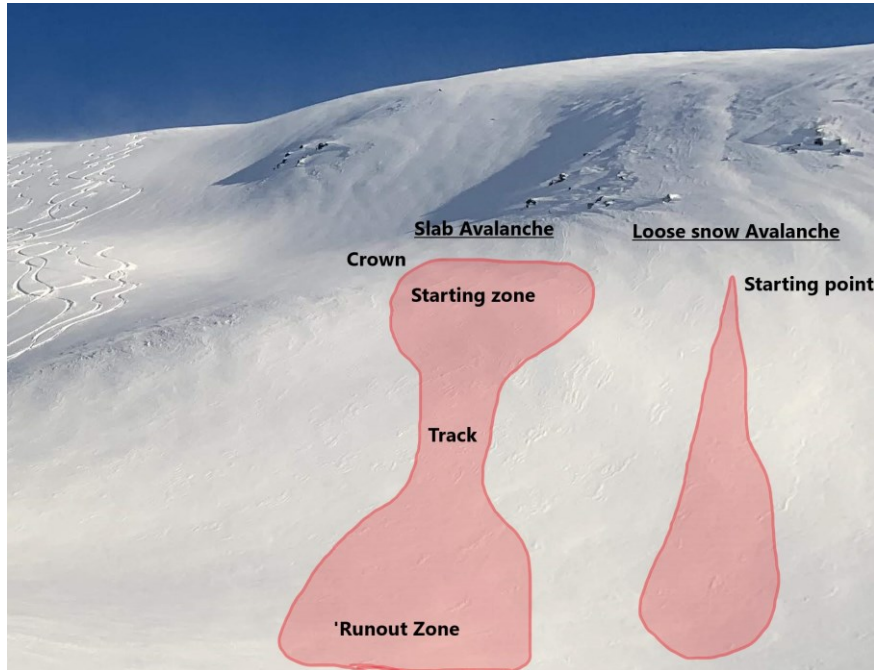


Image 1 Avalanche types and path

Dry slab avalanches are in account for most of the avalanche accidents. They are also most concerning for the winter hikers in the area since the runout zone can reach the hikers even on the flat terrain. And if a human is in a middle of a starting zone and the slab cracks around it, they immediately become an unintended passenger. The speed can be 30 km/h within 3 seconds, and it quickly accelerates up to 130 km/h. (Temper, 2008, pp. 25-26) The average density of snow slab is about 200 kg/m³. The thickness is about 0,4 m, but it can be even much more (David & Schaerer, 2008, pp. 91-92). Everyone can imagine the mass that is moving down the slope even if a small sized avalanche like 20 x 20 m is launched. If being hit by an obstacle in that speed or get buried in the snow it will be always dangerous to anything affected.

Loose snow avalanches tend to be smaller and fracture beneath people while crossing the slope instead of above as slab avalanches often do, but it is also risk for people especially when triggered from above (Temper, 2008, p. 30). The loose snow avalanches can be a trigger for dry slab avalanches.

If the wind is strong enough it has an ability to lift the snow, shape it and transfer it into the downwind side of a mountain, that can create a harder layer of snow. The wind drifted snow is usually a major feature of a snowpack and a local terrain features can have high effect on snow deposition. The required wind speed is dependent of the snow type and for new loose unbonded snow it is typically just 5 m/s. That is usually moving the snow away from the top of the fells

where the winds are heavier, and it is deposited to a downwind side to the gullies and gorges and on steep slopes under the ridges where the terrain changes rapidly. (David & Schaerer, 2008, pp. 29-34). Wind drifted snow is in many instances essential for avalanche formation and it can even release an avalanche by loading the snowpack even in clear days. Wind can also create cornices that are snow structures formed on a lee side of a ridge by a wind drifted snow as in Image 2, the weight of falling cornice can trigger an avalanche on the slope below if released (Temper, 2008, pp. 31-32).



Image 2 Snow cornice

For a slab avalanche to form, it requires enough snow to smooth the ground surface. A bed surface on which the slab slides upon, a harder layer of snow called slab on top, and a weaker layer that fractures and launches the slab to slide on the bed surface. The layers are formed in a snowpack by the changes of weather during the season that are buried by the new snow layers (Temper, 2008, p. 27). For a slab avalanche to launch the terrain needs to be steep enough, which is generally from 25 to 50 degrees, the most probable being around 30 to 45 degrees. For steeper slopes > 50 degrees loose snow avalanching reduces the possibility of slabs from forming. (David & Schaerer, 2008, p. 91). To launch, it needs a trigger which can be a natural like wind drifted snow, new snow or temperature change that is causing loading on a snowpack. But in avalanche accidents it is estimated that in more than 80% of fatalities in Europe and US the

avalanche are triggered by a human. (David & Schaerer, 2008, pp. 98-99). The “Whumpf” sounds and fractures on a snow when travelling on it is an obvious sign of instability in a snowpack and are caused by the weak layer collapsing.

The human does not always need to be on an avalanche area to trigger it. Avalanches can also be triggered remotely from distance by loading the snowpack and causing a fracture to the avalanche site. That is concerning for the winter hikers, since the avalanche can be launched from above even from flat terrain if standing too close to the steep slope. The cornices can also be collapsed if standing too close to the cliff and it can trigger the avalanche. It can be much further away from the edge than expected as it looks just like a solid ground from above, but often there is nothing, but air underneath the snowpack.

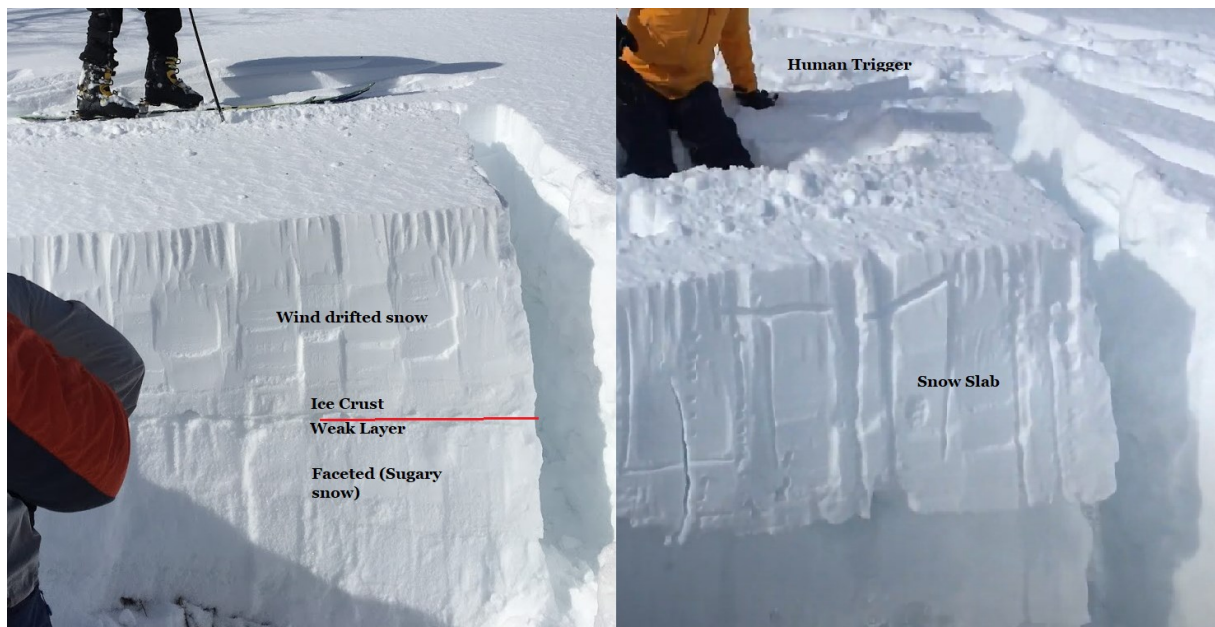


Image 3 Snow layers and Human trigger

The Image 3 shows layers of a snowpack that create the potential conditions for a slab avalanche. During that season, there had not been any new snow in over a month. The temperature changes had formed a faceted snow, which has a weak bond between the snow grains (Avalanche Canada, 2021). On top of it was a thin ice layer created by rainfalls and sun melting the snow together with cold temperatures freezing it. That together formed a persistent weak layer in a snowpack. After that, there were lots of new snow and wind drifted snow forming a slab that could be easily released by any trigger. In this case it was triggered by a human in controlled environment.

3.2 Avalanche risks

The avalanche can be a high consequence risk to people caught in it, and it is causing an average of 100 fatalities yearly in Europe (EAWS, 2021). The avalanches are categorized by size on international standard in a scale from class 1 to 5. Class 1 being relatively harmless to people, but the class 2 can already bury, injure, or even kill a person. The class 5 are the largest avalanches known that will gouge the landscape and can destroy anything on the way (Temper, 2008, p. 66). By the statistics from several countries, the survival chance in avalanche has been 80% for the people that remained in the surface, but only 40-45 % if partially or completely buried. The cause of death being in 65% of cases suffocation, 25% collision with obstacles and 10% hypothermia and shock (David & Schaerer, 2008, p. 244). And in 90 % of the fatalities the human has caused an avalanche, so the knowledge and decision making are important for anyone travelling in the avalanche terrain (FINLAV, 2017b).

Avalanches are quite rare in Finland and sizes are not the same as in more mountainous area, but there are class 1-3 avalanches every year in the major fell areas of Lapland. That can be a risk for anyone moving in avalanche terrain. Without the basic avalanche knowledge people may be taking risks that they are not aware of. It can also increase the psychological risk of not knowing about the avalanches and cause anxiety. There have been accidents outside of Finland where the snowshoers have been part of. And a swiss study indicates that the risk of a fatality in accident has been higher due to limited knowledge and they do not always have the safety equipment (Winkler, 2016). For this thesis, I could not find any statistics or cases from Finland where snowshoers have been part of. But there are people walking in avalanche terrain yearly while the conditions are suitable for avalanches.

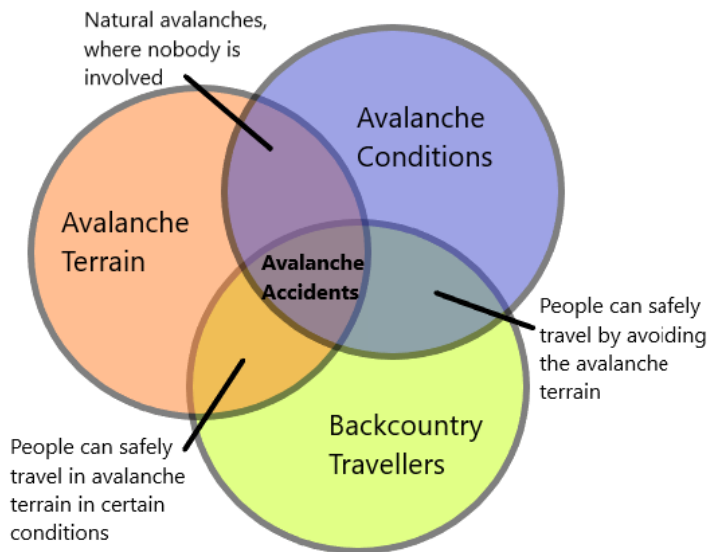


Image 4 Avalanche risk factors

For an avalanche accident to occur it requires several factors, the people who are in an avalanche terrain that has suitable avalanche conditions, as shown in Image 4. For an avalanche to launch, it also requires a trigger, which can be natural like cornice fall, new snow, wind drifted snow or warm weather, but in most accident cases the trigger being human. The winter hiker can remotely trigger it from below or by collapsing the cornice from above. The terrain management is the most important and easiest element in avalanche safety. To understand in which snow conditions the avalanche terrain is safe to travel is very complicated. (Temper, 2008, p. 67)

The avalanche area consists of the starting zone, the track and runout zone as in Image 1. The zone being where the unstable snow failed and began to slide and accelerate quickly. An avalanche track is the slope below the starting zone. Avalanche track connects it to the runout zone where deceleration is rapid, and the collected snow is deposited. The crown is the fracture line of a slab avalanche. Main cause that allows snow avalanche to launch is the slope steepness when there is not enough friction to hold the snow. The lower limit of the steepness for an avalanche are dependent the snow conditions, which by the experience for dry snow avalanches are 25° . (David & Schaerer, 2008, pp. 109-111). Because a kinetic friction is less than a static friction, the steepness for the track can be less than in the starting zone. The typical slope angle for an avalanche tracks are over 15° and for run-out zones 15° or less and it is being dependent of the terrain and size of the avalanche how long it can travel (David & Schaerer, 2008, p. 117).

Track and the run-out zone can be on an open slope, or it may follow the gullies or other depressions that are called as a terrain trap.

Most of the slab avalanches start at 30°-45° with 38° being the most critical steepness, and only few percent at 25-30° (Temper, 2008, pp. 68-69). Therefore, the 25° seems to be the steepness on an open slope from which below the friction is high enough for dry slab avalanches to launch. A dense forest or rough ground with rocks or boulders can sometimes support and anchor the snowpack in the starting area until it is thick enough to form a relatively smooth surface. Though the dense forest can reduce the chance of an avalanche launch, the avalanches from above may be almost unaffected by the trees. Open-spaced forest or scattered boulders and rocks have a limited or no effect and they affect the snowpack so that the avalanche is easier to trigger close to them. (David & Schaerer, 2008).

To be able to avoid avalanches, it is the easiest to learn to recognize avalanche terrain by the slope steepness and there are many tools that will help in measuring it. Inclinator is probably the easiest, many compasses have inclinometer and most of the smartphones are also capable of measuring the steepness with the compass application provided. There is also quick method to measure the steepness by using the ski poles. All the previous methods can be practiced during the course. There are also maps with terrain steepness drawn with colours as in Image 5 from Pyhätunturi area. With that it is easy to recognize the avalanche terrain and plan the trips if you know where you are. The steepness can also be estimated from the contour line spacing. The closer the contour lines are to each other the steeper the slope is.

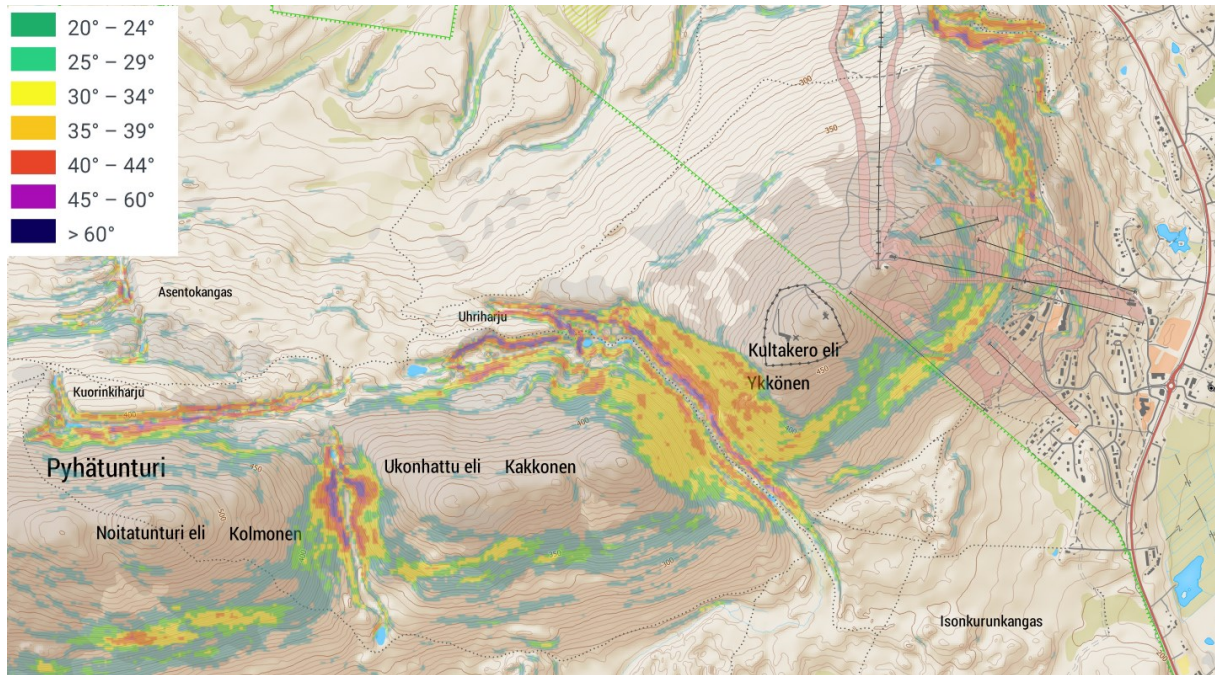


Image 5 Topographic steepness map, Source: Rewindr © 2019 Relaa.com

The snowshoers and hikers are typically seeking for a gentler terrain than backcountry skiers, as they are seeking for steeper sections for pleasurable skiing. The basic rule for safe travelling for both is to avoid steep slopes when the snow is unstable and not going below them (David & Schaerer, 2008, pp. 118-119). To be able to evaluate the avalanche conditions by snow, it would require more knowledge that is learned during this course. But if somebody is interested, they can continue into the higher-level courses that will be presented during the course.

The most likely risk for winter hikers is while moving in a gentler terrain under the steep slopes. The steepness above 25° is already quite challenging to move which will be noted during the course. The safe distance from the avalanche terrain is generally the 3 times the height of the avalanche terrain. It can cause risks to people even on a flat terrain and especially in the gullies or gorges where the sidewalls are steep, and the gully forms a terrain trap. Also walking from above too close to the steep cliffs carrying cornices is a risk. It can feel like standing on a solid ground, but often there is nothing but air underneath the snowpack. The fracture point can be farther back than expected. There can also be false presumptions of safety if you end up following the trails made by others or summer trails that are not always safe during winter. For example, there are summer trails going through the gorges, which is in avalanche terrain. The bottom of Isokuru at Pyhäntunturi is troublesome as it is popular summer trail that many people

also end up hiking during winter. But the snow conditions can vary daily, and in some conditions, it can be a risk walking there. In this basic course, the focus in avalanche safety will be on identifying the terrain that is avalanche safe in almost any conditions.

3.3 Other winter hazards and risks

Aside from avalanches the Finnish Lapland has many other hazards during winter and even though the course is focused on the avalanche safety, some other winter related hazards will be studied while creating the course program. The remote location, harsh weathers and rapidly changing environment can do the hiking more challenging during winter and even little incidents can lead into serious consequences without proper knowledge and preparation. In this thesis, we have chosen the most relevant hazards affecting the winter hikers in the backcountry during winter conditions. The information was gathered from the experience of the instructors and the expert interviews and studies done on the topic.

The cold weather combined with heavy winds can be a hazard to anyone affected. During the thermic winter when the temperature remains below zero, usually begins in mid-October in Lapland and can last over 200 days. The coldest temperatures can go as low as $-50\text{ }^{\circ}\text{C}$ in Lapland, but average temperature during winter months being $-12,6\text{ }^{\circ}\text{C}$ in Sodankylä (Ilmatieteenlaitos, 2020). The fell regions like Pyhätunturi have its own microclimate. It means that the national forecast is not always accurate in the area and the conditions can change rapidly. Winds on top of the fells especially on the winter months can be much higher than on the lower elevation (Ilmatieteenlaitos, 2008), and when the cold air stays in lower elevation due to inversion the temperature can drop much lower than forecasted (Takala, 2012).

The exposure to cold weather increases the risk of hypothermia. It means that inner body temperature dropping below $35\text{ }^{\circ}\text{C}$ and it occurs when body releases more heat than it produces. If the cooling cannot be stopped it can lead to serious consequences and eventually death. (Ilmarinen, 2011, p. 32) Moving in cold weather for hours can slowly cool down the body and walking in deep snow can make even fit and experienced people exceeding their abilities and get fatigued. When stopping to rest, the body will cool down quickly if there is no protection from cold. Combined with lack of energy, dehydration, improper or wet clothing with heavy winds will highly increase the risk of hypothermia. For inexperienced hikers with insufficient skills and equipment it is a serious risk in the fells of Lapland where the weather changes quickly. There are rescue operations like that yearly in Finland. (Ilmarinen, 2011, p. 46) In a

remote and wide destinations like Pyhätunturi it may take over an hour to get help. Even little accidents or equipment brokage can cause immobility. And if the hiker is not prepared or is not carrying necessary equipment or clothing it can quickly lead into serious consequences like hypothermia. In addition, exposure to cold can cause cold injuries which is a local freezing of body parts or skin that causes tissue damage, especially the body extremities like toes, fingers, nose, ears are vulnerable (Ilmarinen, 2011, p. 72).

The quickly changing weather conditions can increase risk of getting lost and getting fatigued, which can be a risk in the Lapland and can quickly cause for example hypothermia and anxiety if unprepared. Landscape can change rapidly due to snow and winds, that can hide the route markings, it can also decrease the visibility rapidly and cover your own tracks with snow. The nature can be full of paths that are not on the map during winter, from which you cannot know where they lead. The area of Pyhä-Luosto National Park is 152 km² and it is located in the Lapland where the distances are long that will increase time to get help so good preparation is usually essential to be able to control the hazards.

Frozen lakes and rivers are a threat if it cannot support human it may lead into getting wet shoers or even immersion. The ice conditions are difficult to predict and ice thickness can vary considerably on a lake by currents or underwater springs and ice formed on flowing waters can be dangerous, sometimes solid 5 cm ice layer in the early winter can hold a human, but 30 cm sun melted ice during spring can break under the similar weight (Metsähallitus, 2021c).

3.4 Risk management

The risk management is important for safety and can be defined as the systematic application of management policies, standards, and procedures to identify, assess, control, and monitor the risks to create safe environment. The risks can be subjective or objective, the subjective is under the control of human being. Such as a safe route choice to meet the abilities and using the proper equipment. The objective risk has limited control if we end up in unsafe terrain such as being hit by avalanche, falling through ice or blizzard. (Mortlock, 1984)

Risk is an essential element of an adventure and is part of every adventurous activity. The risks can be categorized as physical when it can cause physical harm to the body and the causes are usually quite easy to detect. The psychological risks and social risks that are more of an indi-

vidual experience which can increase stress or anxiety on the people. For example, the psychological risk can be caused by new experiences when you are unaware of your own abilities or the environment. The social is related to the social interactions and group dynamics. The social risks can lead into a physical or psychological risk. If for example someone is unable to say their opinion of the route choice because of risk of being embarrassed. It can result in exceeding the abilities in unknown terrain. (Lehtonen & Saaranen-Kauppinen, 2020)

It is not possible to create an objective evaluation of all risks and make safe environment for everyone. Since those are determined by the subjective and objective factors and the risk-taking acceptability between people are different. Direct feedback is also poor indicator of safety, as of that we can do things that are risky and come away unharmed with blind luck. For instance, moving in avalanche terrain we can be and feel safe in 9/10 times and we end up returning into the same route with a routine, but the tenth time could lead into a serious accident. Instead, we can use the best practices from the professionals and increase the knowledge of the risks and present some methods for managing the risks, so everyone can make their own decisions based on that.

Risk assessment is a component of risk management where the decisions are made by the importance and acceptability of the risk. One useful tool is the potential frequency and severity of loss model. It can help to conceptualize the appropriate risk control actions for minimizing the likelihood and severity of the incident. (Attarian, 2012, p. 6) For instance, the likelihood and severity of avalanche incident can be high while travel in avalanche terrain with suitable avalanche conditions. But with the terrain management by steepness and knowledge of the snow conditions the likelihood can be minimized. Combined with having proper clothing and safety equipment the severity of accident can be reduced. But it does not always eliminate the risk and it requires the decision from the traveller if the risk is acceptable. With the knowledge of this basic course, for many it should not be enough to justify the travelling in avalanche terrain. In this thesis, I will not get into the rescue scenarios and will only briefly explain the avalanche safety equipment, forecast and danger scale system to be able to explain when they are required.

Avalanche forecast is compiled from weather forecasts and snow stability by the snow profile and stability tests done by qualified avalanche technicians in the area. Pyhä Ski School is creating forecast in the Pyhätunturi area that is based on a five-stage danger scale also used in North America and elsewhere in Europe. The system can help with planning the suitable back-country route by the conditions, but the human observation is essential during the trip in the

decision making. Most of the accidents occur in the stages 2 moderate and 3 considerable. Therefore, the travelling should not be based only on the avalanche danger scale. It is essential to be able evaluate the snow conditions during the trip in avalanche terrain and it requires more knowledge and understanding the safety and rescue procedures in case of an accident.

Each person travelling in avalanche terrain should carry the basic avalanche safety equipment, they are used in a rescue scenario to locate and dig out the buried victim. The equipment consists of an avalanche transceiver, a probe, and a shovel. Transceiver is a device which transmits and receives radio signals and can be used to roughly locate the buried victim. Probe is a long collapsible rod that is used for finding the victim by contact while pushed through the snow and the shovel is used to dig out the victim. (David & Schaerer, 2008, p. 240) The avalanche safety equipment is only effective if a person in a group is struck by an avalanche, but if the avalanches can be easily avoided, then the safety equipment is not always essential. That is the case with the winter hikers while avoiding the avalanche terrain.

Based on that, the basic course focuses on terrain management to be able to avoid avalanche terrain. And in that case the rescue procedures with the safety equipment will not be practiced. Some other safety rules that can be directed to anyone who is travelling backcountry also in fells of Finland during could be similar as The Norwegian Mountain Code that was first created by Norwegian Tourist Association with the Red Cross in 1954 (The Norwegian Trekking Association, 2020). It has the following 9 basic rules,

- (1) planning the route by your own and groups abilities and informing for others where you are going,
- (2) adapting the trip according to your abilities and conditions,
- (3) paying attention to weather and avalanche warnings,
- (4) being prepared for storms and cold weather, even on short trips,
- (5) having the necessary equipment to be able to help yourself and others,
- (6) making safe terrain choices by recognizing the avalanche terrain or unsafe ice,
- (7) always knowing where you are by using map or compass or GPS devices,
- (8) turn in time, if getting exhausted,

(9) save energy and seek shelter if necessary.

The proper equipment for any trip during the winter is necessary and the most important being the clothing which will decrease likelihood and severity of the risks of weather. The proper clothing is an individual experience and for many it consists of layering the clothing. Layering enables an easy adjustment of the clothing by the changing weather or terrain. It is important for the heat management, as the wet clothing from sweating or some external source will not be able to hold the heat anymore. (Ilmarinen, 2011) Normally the layers include the base layer that will move the moisture away from the body, and middle layer that will work as an insulation, and a shell protecting from the wind. In addition, proper shoes, gloves, and headwear is necessary to protect the extremities from the cold.

Some extra equipment in a backpack for even a short trip can increase safety by having some necessary gear in case of an accident. It should include some extra warm clothing, enough food and drinks, fire starter, headlight, a first aid kit, GPS/map and compass, some tools for repairing the equipment, mobile phone with 112 app. The phone coverage is excellent in Finland, but in some areas, it can be weak and there are blind spots in many areas which may set difficulties in getting help if needed. The extreme cold weather can also drain the batteries of the phones, that can increase the probability of getting lost, but also make it impossible to call for help (Metsähallitus, 2020b).

4 OUTDOOR ADVENTURES

“To adventure in the natural environment is consciously to take up a challenge that will demand the best of our capabilities physically, mentally and emotionally. It is a state of mind that will initially accept unpleasant feelings of fear, uncertainty and discomfort, and the need for luck, because we instinctively know that, if we are successful, these will be counterbalanced by opposite feelings of exhilaration and joy.” (Mortlock, 1984, p. 19)

In this chapter, I will explore the basics of adventures to understand the human and risk-taking behaviour. Use the knowledge base of adventure and outdoor education for the applicability of different pedagogical models for the avalanche and winter safety course. During the course, the participants will learn some technical skills to understand the proper equipment and how to use them and several methods to evaluate the terrain and conditions. Various environmental skills will be practiced for recognizing the hazards and increase the awareness of risks. That can also improve the human skills by growing self-confidence and give better understanding of someone’s own abilities to control the risks.

The nature-based tourism and nature adventures has been trending in the world and our lives are filled with images from adventures in social media and marketing. People can purchase adventures with any levels of challenges in many forms, and with the amount of information available it has become more accessible for everyone even independently. Generally, adventures seem to be associated with healthy living, success, and challenge, and are seen as enjoyable experiences. But it can also affect our risk-taking behaviour, if people without enough competence end up pursuing far too difficult adventures causing unnecessary risks and accidents. (Hodgson & Berry, 2011, pp. 5-9)

4.1 Stages of adventure

For an experience to qualify as an adventurous experience, the outcome must be uncertain, and risks and hazards lead to uncertainty. The risks can be either physical, mental, or social and the experiences have a high emotional state. Therefore, the risks are essential part of any adventurous activity and it involves challenge where people use their competence of risks to resolve the uncertainty of the outcome. Competence is a combination of skills and without enough competence the uncertain outcome is generally controlled by the random element of chance (Priest & Gass, 2017, pp. 30-31). The skills required for any adventurous experience can be

roughly categorized into four sections as technical, fitness, human and environmental skills (Mortlock, 1984, p. 29). The adventure is always a subjective experience, and the competence level impacts your and ability to control the uncertainty and risks. Mortlock defines adventure in four levels, and it can be presented as in Figure 1.

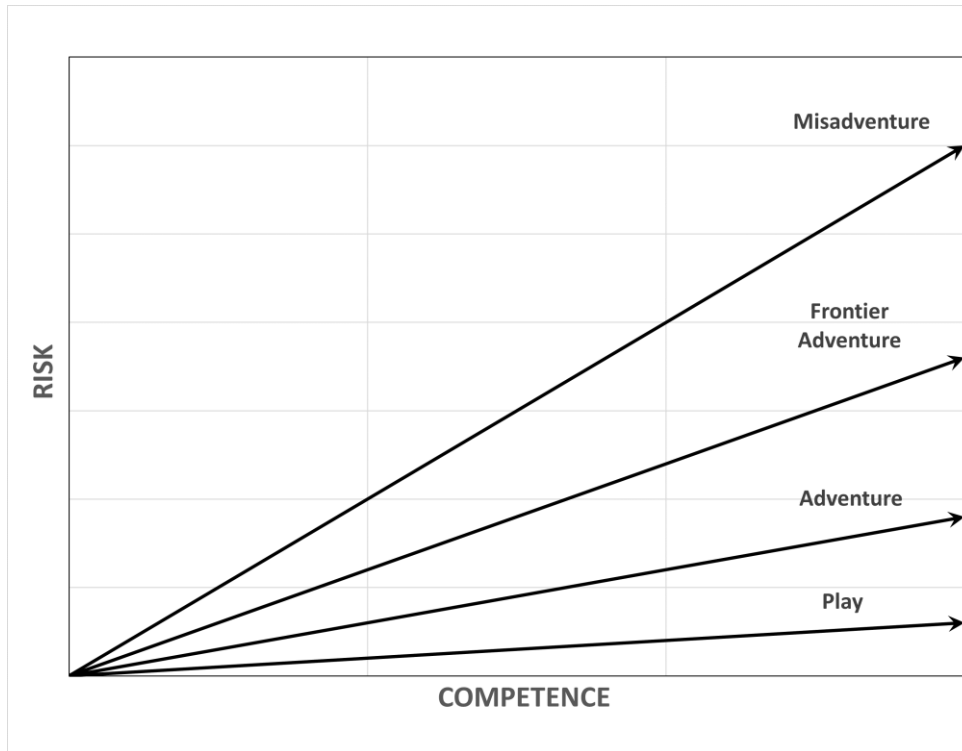


Figure 1 Stages of adventures in outdoor journey

The first level of adventure is the play zone, in which the person is working on considerably below his normal abilities. The fear of risks is absent and the response for the activity can be pleasant and fun, but sometimes boring, or even waste of time. The next level is the adventure, when the person feels being in control of the situation and the fear of risk is minimal. He/she is using the competence to overcome the uncertainty and is not disturbed by feelings of boredom and lack of involvement. Stage three is the frontier adventure when the person has a fear of physical harm or psychological stress and feels no longer being in control of the situation. But with high enough level of competence, the person can overcome the experience without accidents and if successful it will be counterbalanced with a feeling of satisfaction and joy. The last stage is the misadventure when the challenge is beyond the control of the person and the fear is present, it may cause various forms of physical and psychological damage and is resulted with immediate negative and disruptive feelings. (Mortlock, 1984, pp. 22-24)

That can be one of many reasons why people are seeking for adventures to experience the satisfaction and joy, but it requires sufficient competence to do it safely. It is difficult to make an adventurous product or suggest routes that it is suitable for everyone to get the desired outcome. Instead, this course will focus on their personal skill development so they can pursue their own independent adventures. The course focuses on identifying the hazards and risks and develop their competence so they can avoid the misadventures.

4.2 Adventure and outdoor education

Other than being just risky or enjoyable, adventures can also be beneficial in many ways. It provides opportunities for diverse learning outcomes and personal growth through challenging experiences especially in the adventure levels of 2 and 3. Adventure and outdoor education is an active process of learning through those experiences. It challenges the participants to face the unpredictable outcomes. It can for example promote the participants engagement and agency, sense of community and increase the value of nature and sustainability. It is based on experiential learning that is learning by doing with reflection. Outdoor education uses the methods in natural environment. Adventure education is a branch in outdoor education, which uses an adventurous activity with goals. It involves a personal and group challenges usually requiring decision making, co-operation, communication, trust, and testing of personal competence on psychological, social, or physical risks. (Priest & Gass, 2017, p. 29)

Learning is a process of acquiring new knowledge or skills that can happen in any learning environment and in experiential learning it is acquired through the actual experience. It is based on belief that learning is done by people, not to them. They learn best by direct contact with learning experiences that are realistic, challenging, engaging, meaningful and physically active. In that way, the learning becomes more natural to the learner and it is widely used method in outdoor and adventure education. There are different models for experiential learning and in Kolb's model it is presented as a four-stage process cycle as in Figure 2.

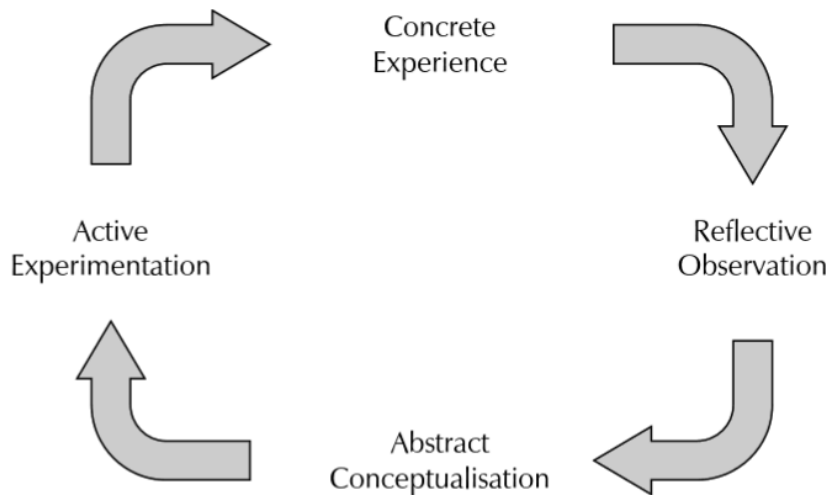


Figure 2 Kolb's experiential learning model

The *concrete experience* relates to the experience itself, that is the challenging adventurous activity. In *reflective observation* the learner reflects to the experience to develop meaning for it. In adventure education it is typically supported with a reflective discussion or some other reflection methods. In *Abstract Conceptualisation* stage the learner assimilates their reflective thoughts into general principles. In *Active Experimentation* stage the learner brings together the thoughts from the similar situations and applies it in a new setting and from that starts a new cycle. (Hodgson & Berry, 2011, pp. 66-67)

In the course, experiential learning and learning by doing will be used as a method to link the learning from indoors to the new settings in outdoors. It will include some terrain evaluation tasks so they can see the relevance of the learning straight away in natural environment. It enhances challenge, authenticity, participation, comprehensiveness, unpredictability, and cooperation during the course. Those are all good characteristics for adventure and outdoor education in Finland (Seikkailukasvatus.fi, 2018).

5 DEVELOPMENT AND RESEARCH METHODS

In this chapter, I will discuss the development strategy and the research methods used in my thesis. The project was mainly practice-based development project. The product of the thesis is the avalanche and winter safety education manual and materials for Pyhä Ski School. From my research I could not find any similar basic avalanche education for winter hikers available in Finland. The new course should be on sale by the ski school in the upcoming seasons. It should be seen as exciting to the visitors to be sold but also increase their awareness of avalanches and winter safety.

5.1 Research methods

The project was started off by searching and defining the development needs together with Pyhä Ski School and other avalanche safety instructors. The development was based on the expertise of the ski school instructors and the knowledge base from literature together with qualitative research methods.

The qualitative data was collected through interviews from different viewpoints in the field. Four interviewees were chosen from organizations who are operating in the nature environment of Lapland. Those were for instance customer service providers, avalanche instructors and other with relevant experience. The interview method used in the thesis was theme-based with semi structured questions. It allows the interviewees to answer in their own words and leave room for open discussion about the topic (Bradford & Cullen, 2011, p. 92). The goal was to broaden the viewpoint of the development needs and give the interviewees a freedom to share their safety concerns and give advice on the course development.

During the interview, the course content and goals were briefly explained to the interviewees to get the basic idea of it. The discussion during the interviews were related to the safety concerns and their customer experience and good safety practices in avalanche and winter safety. The notes were taken during the interview to gather the data from it. The data was later used to clarify the course goals and structure of the new course to fulfil visitor requirements, safety concerns and regulations in Finland.

Following topics were discussed during the interviews.

- What do you think are the main elements of winter and avalanche safety?

- What are the most relevant avalanche and winter safety practices for winter hikers in Lapland?
- Has there been safety concerns from the visitors or within the work community about the safety of the visitors?
- What advice would you give regarding to this course development?

5.2 Results and analysis

The interviews provided an opportunity to get confirmation on the hypothesis of the course needs and goals. It gave some wider perspective on the issue and some good advice on the course development. The information was taken in account while defining the content and the pedagogical methods of the course. The course content was tailored to meet the requests from the visitors and safety concerns of the organizations working in the area. There has been some request for similar products that can be used for wider range of visitors. The new course would help the service providers in offering the products for them.

All of the interviewees recognized the need for the avalanche and winter safety education for winter hikers. The amount of inexperienced people has increased in the Lapland sometimes they have no real contact to the harsh winter environment. FINLAV avalanche education system and improvements in local avalanche forecasting has already increased the accessibility to safety information and knowledge in the area. But the problem with the current education has been recognized. It was noted that the focus on backcountry skiing may also increase the risk of false information that the avalanche safety is only concerning the backcountry skiers.

The most concerning element in avalanche safety was considered to be the gullies with steep sidewalls and cornice falls. Those are easily accessible by anyone and for many it is a great experience to explore for the scenery, but the risks may not be recognized. The bottom of the gully is a huge terrain trap even though it is easy to travel due to the flat terrain therefore it can make false presumption of safety. There are also marked summer trails and tracks of other people going through the gullies. Especially the Isokuru and Aittakuru in Pyhäntunturi has been troublesome. The images in the course and maps will present those areas and those will be used as an example while travelling outdoors if possible.

The steep slopes are also an avalanche terrain, but those are not so easily reached by winter hiker. For some, it may still be fun experience and adventure to slide down or hike up the hills

and they are not aware of the risks. The walking in the steeper terrain will be tested during the course. But for travelling in avalanche terrain, the amount of knowledge required would be much higher than can be provided within this course and the further education possibilities will be presented.

Aside from the avalanche safety, the quickly changing weather conditions and cold weather during winter was concerning for visitor safety. The time to get help in the wilderness in Lapland is often long so it is necessary to be able to survive some time on your own. All of the interviewees supported the value of good preparation and some necessary equipment to be able to cope with the cold weather. Those will be presented during the course with some good habits for planning the trip and using the local service providers. It was mentioned that the local organizations are selling or renting products that can highly increase the safety. For example, some people may be going out without proper shoes, but those could be rented from the area.

One interviewee said that many people who are travelling in the area do not have topographic maps with them and may not know how to use compass and map. Instead, the phone or simple area map may be the only tool for navigating. It will be considered in the course program, and it will provide some tips for keeping the phone battery alive in winter conditions and not solely trust on one device.

It was highlighted that the information in the safety lesson should be relevant to the target group of the course. For example, the images should meet up with the terrain and the conditions in the area and be from the viewpoint of the winter hiker. There could be some images of a total white-out to understand how it can be difficult to navigate and areas of possible avalanche terrain which may be easy to access by anyone.

6 PRODUCTS

In this chapter, I will describe the products and documentation for the Pyhä Ski School that were developed during the project. The products consist of theory lesson and outdoor program that can be run separately or be linked to make it more authentic. The goal of the course is in increasing the knowledge of the avalanches and other winter risk factors and give tools for risk management to avoid accidents. To run the course, Pyhä Ski School needs the manual for the instructors, theory lesson presentation and required safety documentation in Finland.

The theory lesson consists of basic winter and avalanche safety information concerning the winter visitors in fell areas in Lapland. It will be mainly focused on the avalanche hazards and how to recognize the avalanche terrain. The winter hikers will be generally hiking without avalanche safety gear. For that reason, it was decided that the use of avalanche safety equipment and rescue scenarios will be left out from the course program. The theory lesson should give just enough knowledge to recognize the hazards to be able to make justified decisions while planning the trip and travelling. With too much and irrelevant information it would make it harder to digest and if the knowledge will not be used in the future it will be easily forgotten. In addition, some other relevant winter-related hazards, and tools to manage the risk will be presented. There will be some general guidelines for safety, that will include for example importance of proper clothing some equipment to carry with you on every trip.

Some good practices for planning the backcountry trip will be presented during the course similar as Norwegian Mountain Code. For instance, using the local knowledge of the nature centres and organizations, or other reliable information sources from internet or brochures and by using the guided services. The participants need to be aware of safe route choices and travel by their own abilities. Particularly when going out from the official marked routes, then competence needs to be sufficient and good preparation is essential. Some restriction and hazardous areas like Isokuru in Pyhätunturi will be presented as an example. It is a restriction area where the travelling is only allowed on official summer trail, but it is also an avalanche terrain. In some conditions, it is not safe to travel and travelling should be limited during winter.

The outdoor lesson will continue from that and put the practices in use in a natural environment. That consists of different tasks performed in the backcountry with the experiential learning methods. The tasks will be participatory so the people are responsible of their own decisions and the instructor can give tips to help with the tasks. It will involve some terrain assessment

tasks, measuring slope steepness with different tools and decision making based on that information. They will be testing the different steepness to walk on with snowshoes and explore some hazardous terrain close to Pyhätunturi to recognize the relevant hazards to them.

The safety documentation will follow the regulations in Finland to be able run the course. The programme service provider is responsible of the safety of the products and they must ensure that the service will not pose a danger to anyone's health or property and it is controlled by Finnish Safety and Chemical Agency Tukes (Tukes, 2020). The service provider must identify the risks that are caused when the people interact with the hazards and determine the probability and severity of the risk.

The safety plan includes the procedures the description of the activity with the responsible leaders and group information. It has the evacuation points and plan with some procedures to be followed in case of an accident. The risk assessment is a list of most probable hazards and risks with procedures to manage the risk. It confirms that the hazards and risks have been considered and they are in acceptable level to run the course. It includes the avalanche hazards and winter hazards, but also some other that are not involved in the course program. For example, bad social atmosphere, phobias, slippery terrain, and many others. The risks will be managed with good preparation, proper equipment, and information during and before the course.

The safety plan and risk assessment are included in the project plan (see Appendix 1). It includes the necessary equipment for the instructor and the participants for the course. It will also be a manual for the instructors to help with running the program. It has some pedagogical methods and goals of each activity that will be used during the indoor and outdoor programs. The project plan also includes several procedures for sustainable development and how it is considered in the program. The participants have a possibility to look for the safety plan and evacuation plan, which increases the safety in case of an accident.

7 CONCLUSION

The goal of this thesis was to research requirements for avalanche and winter safety knowledge for winter hikers. Based on the research, we developed a new course that should be more suitable especially for that customer group. The product consists of indoor and outdoor lesson that together will give them enough knowledge to be able to make safe and justified decisions during and before their own adventures. During the process, the need for a similar course came up from many visitors so there were definitely some demands for it. The trends and the research also indicate that the demand might be even higher in the future.

The importance of safety knowledge is essential for visitor safety, but the new product can also invite new customers to Pyhätunturi and Pyhä Ski School. It will also benefit the co-operation with different organizations so they can offer the new product for the visitors that are worried about the safety. Additionally, ski school can advertise products of other organizations that promotes safety and sustainability in the area.

Pyhä Ski School can use the results and the product of this thesis to develop their own businesses. The results of this thesis can also benefit many organisations working in similar environment. For further development, several other materials could be developed after this process to increase the safety awareness. That could include online materials that are available for everyone with guidelines for recognizing the avalanche and other winter hazards.

The COVID-19 situation affected the thesis process so that the travelling to the Pyhätunturi was not possible and the course could not be piloted during this thesis process. The images suitable for the presentation was limited and more will be taken in the future to make it more relevant for the participants. The process will continue after this thesis and the product will be piloted hopefully during the spring or autumn of 2021. Otherwise, the product is ready to use and with some adjustments after that. Hopefully, it will be available for everyone during the winter season 2021/2022.

8 REFERENCES

Attarian, A., 2012. Risk Management in Outdoor and Adventure Programs : Scenarios of Accidents, Incidents, and Misadventures. Champaign: Human Kinetics.

Avalanche Canada, 2021. Glossary - Faceted Snow.

Retrieved 22/02/2021 <https://www.avalanche.ca/glossary/#faceted-snow>

Avalanche Canada, 2021. What is a avalanche terrain?.

Retrieved 17/02/2021 <https://www.avalanche.ca/start-here#avalanche-terrain>

Bradford, S. & Cullen, F., 2011. Research and Research Methods for Youth Practitioners. s.l.:Taylor & Francis Group.

David, M. & Schaerer, P., 2008. The Avalanche Handbook. 3rd ed. Seattle: The Mountaineers.

EAWS, 2021. Fatalities - European Avalanche Warning Services.

Retrieved 24/02/2021 <https://www.avalanches.org/fatalities/>

FINLAV, 2017a. Finnish Avalanche Education.

Retrieved 8/1/2021 <https://www.ski.fi/en/lumivyory/in-english/>

FINLAV, 2017b. Vyörytietous 1.

Retrieved 24/02/2021 <https://www.ski.fi/lumivyory/vyorytietous/vyorytietous-1/>

Hodgson, C. & Berry, M., 2011. Adventure Education : An Introduction. 1st ed. London: Taylor & Francis Group.

Ilmarinen, R., 2011. Hypotermia: Kylmän Haitat Työssä Ja Vapaa-aikana. Helsinki: Työterveyslaitos.

Ilmatieteenlaitos, 2008. Tuuliolot tuntureilla.

Retrieved 23/02/2021 http://www.tuuliatlas.fi/tuulisuus/tuulisuus_8.html

Ilmatieteenlaitos, 2020. Talvitiilastot.

Retrieved 23/02/2021 <https://www.ilmatieteenlaitos.fi/talvitiilastot>

Lehtonen, K. & Saaranen-Kauppinen, A., 2020. Turvallisuus seikkailukasvatuksen oppimisprosessissa. Seikkailukasvatusta Suomessa, pp. 249-250.

Manuele, F. A., 2013. *On the Practice of Safety*. 4th ed. Somerset: John Wiley & Sons, Inc..

Metsähallitus, 2020a. Asiakasturvallisuuden riskien hallinta.

Retrieved 12/02/2021

https://www.luontoon.fi/documents/10550/59432913/Turvallisuusselvitys_YMlle_31122020.pdf

Metsähallitus, 2020b. Safety - Nationalparks.fi.

Retrieved 23/02/2020 <https://www.nationalparks.fi/hikinginfinland/safety>

Metsähallitus, 2021c. Heikot jäät.

Retrieved 23/02/2021

<https://www.luontoon.fi/retkeilynabc/turvallisuus/ennakoijavalta/heikotjaat>

Metsähallitus, 2021d. Kansallispuistoissa ennätysvilkas vuosi - Koronapandemia vahvisti pitkään jatkunutta trendiä retkeilyn suosiosta.

Retrieved 12 02 2021] <https://www.luontoon.fi/-/kansallispuistoissa-enn%C3%A4tysvilkas-vuosi-koronapandemia-vahvisti-pitk%C3%A4n-jatkunutta-trendi%C3%A4-retkeilyn-suosiosta>

Mortlock, C., 1984. *The Adventure Alternative*. Milnthorpe: Cicerone Press.

Priest, S. & Gass, M., 2017. *Effective leadership in adventure programming*. 3rd ed. Champaign: Human Kinetics.

Pyhä Ski School, 2020a. Pyhä Ski School.

Retrieved 7/1/2021 <https://pyha.fi/yritys/pyhatunturin-hiihtokoulu>

Pyhä Ski School, 2020b. Pyhätunturin Hiihtokoulu.

Retrieved 12/02/2021 <https://pyha.fi/yritys/pyhatunturin-hiihtokoulu>

Pyhätunturi, 2017. Vapaaalasku Pyhällä.

Retrieved 16/02/2021 <https://pyha.fi/hiihtokeskus/vapaaalasku>

Seikkailukasvatus.fi, 2018. Brochure Adventure and Outdoor Education.

Retrieved 23/02/2021 <https://www.snk.fi/wp-content/uploads/esite-seikkailukasvatus-en.pdf>

Takala, P., 2012. Pakkanen ja inversio.

Retrieved 23/02/2021 <https://blogi.foreca.fi/2012/01/pakkanen-ja-inversio/>

Temper, B., 2008. Staying Alive in Avalanche Terrain. 2nd ed. Seattle: The Mountaineers.

The Norwegian Trekking Association, 2020. The Norwegian Mountain Code. Retrieved 02/03/2021 : <https://english.dnt.no/the-norwegian-mountain-code/>

Tukes, 2020. Programme and adventure services.

Retrieved 29/03/2021 <https://tukes.fi/en/products-and-services/services-for-consumers/programme-and-adventure-services>

Winkler, K., 2016. Avalanche risk in winter backcountry touring: status and recent trends in.

Retrieved 24/02/2021

https://www.zora.uzh.ch/id/eprint/126510/1/winkler_etal_avalanche_risk_backcountry_touring_issw2016.pdf

Wowk, S., 2021. Why All Snowshoers Should Be Avalanche Aware (Even Beginners).

Retrieved 17/02/2021 <https://www.snowshoemag.com/2020/05/08/why-snowshoers-avalanche-aware/>

Yle, 2021. Osa laskijoista suhtautuu lumivyöryjen riskeihin vähättelevästi – vapaalaskija: On helppo ajatella, että ei ole vaaraa kun ei ole vuoriakaan.

Retrieved 17/02/2021 <https://yle.fi/uutiset/3-11771908>

APPENDICES

Appendix 1. Project plan

PROJEKTISUUNNITELMA

INFORMAATIO OSALLISTUJILLE	
Tapahtuman nimi	Lumivyöry- ja talviturvallisuuskurssi
Tapahtuman kuvaus	Lumivyöry- ja talviturvallisuuskoulutus talviretkeilijöille Kurssin teoriaosuus järjestetään sisätiloissa Pyhätunturin keskuksen alueella Ulkoilmakoulutus läheisellä tunturilla sopivissa kohteissa olosuhteista riippuen
Ryhmä	Pyhän hiihtokoululun kouluttaja(t) + kurssilaiset
Tavoitteet	Turvallisuustaidot: Lumivyöryn muodostuminen, ymmärrys talven ja lumen vaaroista, riskienhallinnan kehittyminen, inhimillinen tekijä, lumivyörymaaston tunnistaminen, turvallinen reitinvalinta, maaston arviointi eri menetelmin, päätöksenteko ennen ja retken aikana, varustetietous
Matkan pituus ja kesto	1 - 2 Tunnin teorialuento, sisätiloissa 2 - 3 Tunnin käytännön harjoittelua lähialueen maastossa olosuhteiden mukaan
Paikka	Pyhä-Luoston kansallispuisto, Pyhätunturin alue
Aika	Talvi 2021-2022
Kieli	Suomi
Vaikeusaste	Helppo / Keskivaativa (Riippuen sää- ja lumiolosuhteista)
Ohjelma	Kokoontuminen kurssitilassa <ul style="list-style-type: none"> • Lumi- ja talviturvallisuus perusteet • Riskienhallinta • Inhimillinen tekijä • Varusteet • Retkeen valmistautuminen • Retken aikana toimiminen Valmistautuminen ulkokurssille <ul style="list-style-type: none"> • Retken suunnittelu • Varusteiden pakkaaminen • Siirtyminen lähitunturille Maastossa <ul style="list-style-type: none"> • Lumivyörymaaston tunnistaminen • Kaltevuuden mittaus • Haastavassa ja helpossa maastossa liikkuminen • Reitinvalinta ja päätöksenteko

Tarvittavat varusteet	<ul style="list-style-type: none"> • Ulkoiluvaatetus olosuhteiden mukaan • Tautotakki • Kauluri, pipo, hanskat • Päiväreppu • Talvijalkineet tai vaelluskengät • Älypuhelin 112 sovelluksella • Sauvat • Lumikengät tai sukset ja sauvat (Mahdollisuus vuokrata) • Ruokaa • Juomaa • (Kuumaa juomaa termoksessa) • (Aurinkolasit)
Tärkeät valmistelut ja muu informaatio	Ohjaajalla mukana myös EA-laukku, ylimääräiset lumikengät, korjaussetti, hypotermiapussi, lisä evästä ja vettä, termos täytettynä kuumalla juomalla

INFORMAATIO OHJAAJILLE			
Kohderyhmä	Talviretkelijät		
Terveys informaatio	Terveystieto kysytään ilmoittautumisen yhteydessä ja kurssin alussa		
Ohjaajan varusteet	Sama kuin osallistujilla, Lisäksi: Rewindr sovellus puhelimesta, GPS tai kartta ja kompassi, luentotietokone, ensiapupakkaus, varavirtalähde, korjaussetti, varalumiengät, kaltevuusmittareita, sauvat, otsalamppu, (lumenturvallisuusvarusteet)		
Valmistelut ja niiden vastuuhenkilö	Viimeiset valmistelut tehdään edeltävinä päivinä. <ul style="list-style-type: none"> • Varustevuokrausten järjestäminen • Kurssitilan tarkistus • Olosuhteiden arviointi • Alueen valinta kurssin maastokoulutukseen 		
AKTIVITEETTI SUUNNITELMA (lisää rivejä, jos sille on tarve)			
Aktiviteetti/Vastuuhenkilö	Aika	Lisä informaatiota	Kesto
Sisäluento			
Kouluttajien ja kurssilaisien lyhyt esittely	10.00-10.15	Lyhyt esittely kouluttajista ja kurssilaisista, esim. kokemusta luonnossa liikkumisesta ja miksi tulleet kurssille	15min

Teoriaosuus lumivyöry- ja talvivaaroista	10.15-10.45	Luentomateriaalin käyminen läpi painottuen lumivyöry ja talvivaaroihin	30min
Riskienhallinta ja päätöksenteko harjoitteita	10.50-11.20	Lumivyöryennusteet, maaston tunnistus, Rewindr tai muun kartan käyttö, kaltevuuden mittaus	30min
Varusteet retkelle	11.20-11.50	Päivärepun sisältö, mitä pakataan lyhyellekin retkelle, retkelle varautuminen ja retken aikana toimiminen	20min
Jatkokoulutukset ja lumiturvallisuusvälineet	11.50-11.55	FINLAV koulutusjärjestelmän esittely ja lyhyesti mitä ovat lumiturvallisuusvarusteet ja milloin tarvitaan	5min
Ulkokoulutus			
Siirtyminen harjoittelupaikalle	12:45-13:45	Matkalla tarkkaillaan maastoa ja keskustellaan vaaranpaikoista ja mahdollisista riskeistä. Etsitään esimerkiksi jyrkkiä rinteitä, kuruja ja lumilippoja. Jälkien seuraaminen / oman reitin avaaminen.	60min
Jyrkkyyden mittaaminen ja testataan jyrkässä maastossa liikkumista	13:00-13:30	Harjoitellaan jyrkkyyden mittaamista maastossa eri menetelmin. Kokeillaan mikä on miellyttävä jyrkkyys liikkua eri välinein.	45min
Päätöksentekotehtäviä ja paluu lähtöpaikalle	13.30-14.30	Liikutaan takaisin maastossa, jossa joutuu tekemään päätöksiä turvallisista reittivalinnoista.	60min
Kurssin lopetus	14:30-14.45	Kurssin lopetus	10min

KESTÄVÄKEHITYS	
Ekologinen kestävyys	
Luonnon kestävyden huomioiminen	<ul style="list-style-type: none"> • Kansallispuiston erityissäntöjen noudattaminen ja tiedotus • Jokamiesoikeuksista keskustelu • Ei vahingoiteta luontoa, liikutaan merkittyjen reittien ulkopuolella vain lumen päällä
Jätehuolto	<ul style="list-style-type: none"> • Roskapusseja mukana ja roskat pois luonnosta
Energian käytön minimoiminen	<ul style="list-style-type: none"> • Liikutaan jalan tunturikeskuksen alueella • Minimoidaan siirtymiset autolla
Muuta	<ul style="list-style-type: none"> • Mahdollisuus lainavarusteisiin
Taloudellinen kestävyys	
Taloudellisen kestävyden huomioiminen	<ul style="list-style-type: none"> • Käytetään paikallisia palveluita • Vuokrataan varusteet paikallisilta yrittäjiltä • Tehdään yhteistyötä muiden yrittäjien kanssa • Tarvittaessa mahdollisesta lounaalla käynti alueen ravintoloissa

Sosiaalinen Kestävyys	
Sosiaalisen kestävyden huomioiminen	<ul style="list-style-type: none"> • Ei häiritä muita retkeilijöitä • Tutustutaan retkietikettiin
Kulttuurinen kestävyys	
Kulttuurisen kestävyden ja paikallisuuden huomioiminen	<ul style="list-style-type: none"> • Tietoa paikallisesta luonnosta ja kulttuuriarvoista • Kunnioitetaan muita alueella liikkuvia tavasta riippumatta

<h1>Turvallisuussuunnitelma</h1>	
Yleistä	
Tapahtuma	Lumivyöry- ja talviturvallisuuskurssi
Aika ja paikka	
Ryhmä	Pyhän hiihtokoululun kouluttaja(t) + Kurssilaiset

Henkilöitä yhteensä		Aikuisia		Nuoria (12-17 v)	
Ryhmän kuvaus:					
Kouluttajalla lumivyörykouluttajan pätevyys, kurssilaiset voi olla kaiken tasoisia					
Osallistuja lista:					
Ohjaaja(t):					
Kurssilaiset:					

	Nimi	Puhelin
Vastaava ohjaaja		
Varaohjaaja		
Person on call(päivystäjä)		

Tapahtuman/aktiviteetin kuvaus: (aktiviteetti/reitti/lokaatio)

Lumivyöry- ja talviturvallisuuskoulutus talviretkeilijöille

Kurssin teoriaosuus järjestetään sisätiloissa Pyhätunturin keskuksen alueella

Ulkoilmakoulutus läheisellä tunturilla, joissa olosuhteista riippuen valitaan kohteet

EHKÄISEVÄT SUUNNITELMAT

	Kuka tarkistanut?	Milloin(päivämäärä)
Terveysasiakirjat		
Varusteet		
Riskianalyysi		

Muita turvallisuutta edistäviä asioita/toimia: (Suunnittelu, treenit, koulutus, kouluttajat, kokemus, paikallistietämys...)

Kokeneet ja koulutetut ohjaajat tuntevat alueen ja tietää alueen vaarat

Ohjelma suunniteltu hyvin etukäteen

Suunnittelussa on huomioitu turvallisuus näkökulmat ja kurssilaisia koulutettu ennen maastoon siirtymistä

PELASTUSSUUNNITELMA**HÄTÄNUMERO 112**

Johtaja hätätilanteessa

Seuraava vastuussa

Lähin kouluttaja

Ryhmän toiminta hätätilanteessa:

- Ryhmä pysyy yhdessä ja rauhallisena
- Seuraa kouluttajan ohjeita

Johtajat eivät pysty toimimaan / johtajat eivät ole paikalla, ryhmä seuraa suunnitelmaa kuten on ohjeistettu:

Ryhmä pysyy yhdessä, aloittaa ensiavun ja soittaa hätänumeroon 112 jos tarpeen. Soittaa päivystävälle ohjaajalle ja kysyy toiminta ohjeita, pysyvät näkyvällä paikalla, mutta etsii suojaa tarvittaessa.

Evakuointi	Koordinaattijärjestelmä ETRS-TM35FIN	kuvaus kartalla	muuta informaatiota
paikka 1	7433888, 510551	Pyhätunturin hiihtokeskuksen parkkipaikka	Kallunkuja 4, 96900 Pelkosenniemi
paikka 2			
Pelastus ja evakuointi varusteet:			
EA-laukku, puhelin ja varavirtalähde/GPS, 112-sovellus, kartta ja kompassi, hypotermiapussi			

INFORMOINTI SUUNNITELMA			
Onnettomuudesta informoitavat organisaatiot tai henkilöt päivystäjän lisäksi			
	Organisaatio/henkilö	Puhelin	Muuta
1.			
2.			
Informointi ja meldia suunnitelma:			
<ul style="list-style-type: none"> Kouluttajat sekä kurssilaiset eivät kommentoi kolmannelle sektorille, medialle tai sosiaalisessa mediassa Median informointi vastuussa Pyhätunturin hiihtokoulu 			

Muita tärkeitä numeroita	
Organisaatio	Puhelin
Myrkytyskeskus (<i>Poisoning</i>)	(09) 4711
Terveysneuvonta (<i>Doctor on call</i>)	(09)10023
Liitteet	
1	Riskianalyysi

Kirjoittanut:	Päivämäärä:

RISKIANALYYSI			
Palvelun touttaja	Pyhätunturin Hiihtokoulu	Päivämäärä	
Palvelu/aktiiviteetti	Lumivyöry- ja talviturvallisuuskoulutus	Kirjoittanut	Jasu Korhonen
Vaara	Tyypillinen seuraamus	Toimet vaarojen ja riskienhallitsemiseksi:	Parannukset/korjaukset (täytetään retken jälkeen)
Kylmä ilma	Paleltumat, lievä hypotermia	Taukopaikat tuulen suojassa, sään mukainen vaatetus, taukotakki, lämmintä juomaa termospullossa	
Ongelmat kenkien kanssa	Rakot, märät/kylmät jalat,	EA-pakkaus, varustelista ja -tarkistus	
Jyrkät ja liukkaat pinnat	Kaatuminen ja loukkaantuminen	EA-pakkaus, reitinvalinta, kouluttajan valvominen	
Alhainen energia, nestehukka	Uupumus, palelu, väsymys, lievä hypotermia	Riittävästi nestettä ja evästä mukana ja mahdollisuus tauoille	
Ylirasitus	Uupumus, palelu, väsymys, lievä hypotermia	Liikutaan rauhallisesti, mahdollisuus tauoille, realistinen reittisuunnitelma ryhmän mukaan	
Huonot ja vaihtuvat sääolosuhteet	Palelu, uupumus, hypotermia, eksyminen, viivästyminen	Oikea varustus, sään huomiointi retken toteutuksessa, reittivalinta	
Ryhmän eriytyminen	Eksyminen, viivästyminen	Ryhmänhallinta, GPS ja kompassi/kartta, suunnitelma	
Huono sosiaalinen ilmapiiri	Yhteistyön hankaloituminen, negatiivinen ilmapiiri	Ryhmän esittely alkuun, aikaa tutustua kurssin aikana, kouluttajan läsnäolo ja ohjaaminen	
Pimeys	Eksyminen	Otsalamput mukana, pyritään liikkumaan valosan aikaan	
Pelot	Traumaattinen kokemus	Terveyslomakkeet, keskustelu osallistujien kanssa	
Lumivyöryt	Loukkaantuminen	Reitinvalinta, kokeneet kouluttajat, pysytään poissa lumivyörymaastosta	