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HikeWays

Mountain trails for school hiking trips

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Introduction

Introduction

This publication originated in the framework of an Erasmus+ project in the School Education Field entitled HikeWays: Mountain Trails for School Hiking Trips (2021-1-PL01-KA220-SCH-000024131). It is a continuation of a previous Erasmus+ project coordinated by EST, Youth Hiking in the Digital Age (digiHIKE). Although the scope and objectives of the two projects are different, they form a continuity in which the meaning of our present initiative can be best understood.

In the digiHIKE project (Youth Field, 2019 - 2021) we organised a number of trips for young people from Poland, Slovakia and Romania during which the participants used various digital technologies to narrate their hiking experiences (GoPros, mapping software, drones, smartphones). These were informal, hobbyist activities. Due to the coronavirus restrictions we couldn't implement the whole programme as originally planned. Still we managed to organise quite a few trips and workshops in each partner country. The feedback that we received from the participants and leaders encouraged us to develop a new proposal. In particular, the feedback from school teachers eager to engage in a follow-up project prompted the decision to submit a new application in the School Education Field, involving new partners and a new mountainous country (Slovenia).

New groups of students involved in this project used the technologies that we explored with the digiHIKE participants. In particular, the mapping software which had proved to be an excellent tool to share hiking trails online. We also engaged them in aerial photography sessions in the mountains and filmmaking on a hike. However, these activities were planned in such a way as to develop an interdisciplinary learning programme relating to the school curriculum of Biology, Geography, Physics, English, Art and IT. This is in line with a growing conviction among educators, researchers and policy makers that school education should move towards a more integrated education programme, connecting themes from across the curriculum to offer interesting and motivating learning experiences for students. Outdoor investigation of the natural environment with digital tools on hand is a particular case of such an approach, having a potential to link a number of school subjects into integral learning experiences, attractive and enjoyable at the same time.

The HikeWays project also offered new learning experiences to teachers and youth workers acting as facilitators of such school trips. We have organised three international learning mobilities for this group involving participants from three

different countries of the new project, Poland, Romania and Slovenia. The programme of the courses was based on the experiences from the digiHIKE project but now adapted to the particular context of school education, taking into account possible organisational framework of school trips, available technology, safety requirements and curricular standards. In the digiHIKE project we only organised youth mobilities but realised the need to offer a direct introduction to our methods for educators to leverage the impact of the project.

Our initial research showed that the programme of learning activities in this project is innovative in the school education field. While preparing the project we conducted a survey of teachers from our schools and those that we cooperate with that involved 20 respondents from each country. The results explain the reasons that prompted this initiative, so we would like to sum up the key questions and findings here.

- Do you offer cross-curricular learning experiences to students? In what areas are they available in your school?

  The majority of cases relate to STEM subjects. Various science 'laboratories', clubs and workshops all belong to this category of attempts to bridge subjects like Physics, Mathematics and IT into tech projects (e.g. robotics). Still such activities are a niche of school education in our countries where each subject is distinct with a different textbook, curricular standards, exams, etc. The surveyed teachers were interested to see how to practically design and implement interdisciplinary programmes of a wider scope (51 respondents).

- Do you organise excursions for students in your school? If so, what programme do you propose?

  All the teachers answered YES, meaning themselves or their school colleagues. Mostly these were whole class trips to museums or some other cultural attractions in major cities in the country (48 respondents), in some rare cases trips abroad (8 respondents). If hiking trips were organised, they were usually extracurricular activities run in the framework of school clubs/societies (9 respondents). They involved smaller groups of participants from different classes who went on a hike to a nearby location, ran a treasure hunt in the forest or had an overnight stay in a shelter. The purpose was to involve students in healthy, outdoor activities, giving opportunities for having a good time together. The surveyed teachers reported very positive feedback from the participants of such excursions. However, only a small proportion of them took their classes on hiking trips (5 respondents).

❖ How to enrich school trips with new interdisciplinary learning experiences?

This question was meant to trigger some discussion and indeed, the interviews brought a number of points that helped us formulate this project:

- Many teachers argued that a trip to a major city (a typical case) already has a cross-curricular programme as the students visit a number of places of a cultural, historic or even scientific character (37 respondents).
- Although shorter hiking trips in the countryside are usually organised as a social integration and physical activity they sometimes also include a learning component. Given examples: visiting a cultural remnant hidden in the forest, a walk to a historic astronomy observatory on top of a local mountain, collecting plants for a biology lesson, etc (9 respondents).
- In majority cases the trips focused on one aspect (e.g. cultural or historic) and the students acted more like 'consumers' of ready made portions of knowledge, often in amounts hardly consumable, than active explorers of new fields (based on 22 responses).
- The latter mode was certainly more desirable as a learning pathway, as most of the interviewees acknowledged (43), but definitely more difficult to implement than a standard school trip programme (e.g. in Poland 'packaged' tours are commonly sold to schools by travel agencies which simplifies all organisational and didactic efforts).
- Active ecotourism can raise students' healthy lifestyles and boost their engagement in learning but to increase its scale in the framework school education we need more dedicated teachers sharing concrete programmes and motivating others to follow: this is how the majority of the respondents (39) saw the prospect of increasing the number of school classes going on hiking excursions.

While surveying teachers, the potential facilitators of school hiking trips, we realised the challenge of initiating such a programme without external support. Most schools organise trips using services of tourist agencies and guides (inevitable in many cases when a certified guide is required). Similarly, mountain group hiking requires a qualified guide. Also, a skilful use of the technologies which we wanted to propagate in the project (mapping software, drones, cameras) requires a properly trained leader. Ideally, this could be a school teacher, but in reality most teachers would rather appreciate the support of an external facilitator to take the challenge of co-leading such trips. Accordingly, we built the project partnering schools with other establishments working with youth, able and willing to offer relevant competences.

They differed across the partnership. EST (Poland) brought in experience in aerial photography on youth hikes. BLSH (Romania) contributed a creative method of using video narratives for a foreign language teaching in the course of outdoor activities. And SMGA (Slovenia) - a professional expertise of mountain guides supporting school excursions to the mountains.

Another consideration that resulted from the initial research is the value of local and regional trips as compared with excursions to distant locations. They are much easier to organise at a lower cost so more students can be involved. They let students explore their own 'small homelands' often unknown in their riches. If combined with walking in the countryside, they give students an enjoyment of physical exercise in the company of school friends. If skillfully combined with an exploratory learning programme, they strengthen positive attitudes to education projects bridging school knowledge with the real environment in which the students live.

The above findings opened a space for our initiative which aimed at increasing the number of school students taking part in hiking trips that combine physical outdoor activity with an interdisciplinary learning programme. We translated this overall objective into more specific steps over the two-year project in which we set to:

- Organise workshops on aerial photography, filmmaking and digital mapping that take the participants from their screens to explorations of the countryside
- Identify trails leading through sites of cultural and natural interest in the mountain ranges where we are based
- Involve young participants in hiking together on selected trails and sharing the coverage of their expeditions through photos, films and digital maps
- Present the best trails and related learning scenarios in this publication to motivate other teachers and their students to follow our pathways
- Facilitate intercultural encounters of the young participants across the partnership through online and onsite exchange
- Build a wider youth network around shared interests in digital technology and hiking on the foundation laid during these first encounters

The best experiences from this project are narrated in this publication in which we present some of the exploratory learning scenarios that we developed and implemented.

Chapter One is an introduction to the organisation of school mountain hiking trips written on the basis of experiences from our excursions. It covers the following themes:

- Essential equipment for mountain hiking
- Safety procedures as the most essential requirement
- Strategies for a successful mountain hiking trip with a school group
- Tips and advice for educators organising such excursions
- Digital technologies that hook young people into mountain hiking (digital mapping, aerial photography, video making)

Chapter Two presents some of our HikeWays, that is mountain trails walked by us with a programme of learning activities bridging various school subjects. We have chosen three from each country, identified here by the main destination of interest that can be reached:

- Wielka Rycerzowa (Poland)
- Góra Żar (Poland)
- Murowaniec (Poland)
- Cheile Turzi (Romania)
- Piatra Secuiului (Romania)
- Trascau mountains (Romania)
- Kolovrat (Slovenia)
- Vodriž castle (Slovenia)
- Kaštel poštarski (Slovenia)

Chapter Three lists valuable resources and tools that can help educators plan and lead successful mountain hiking excursions. We have chosen resources in the following categories:

- Safety resources
- Tools for digital mapping
- Resources on aerial photography
- And mountain filmmaking

Before we proceed to the main chapters of the publication, we would like to briefly present the project partners who developed it. In line with the preparatory research findings, we have created the project partner teams that involve one school and one organisation working in the youth field in each national team. In this way we could ensure direct involvement of school students and teachers (our main target groups) and facilitators of learning activities for young people with competences required to lead school classes on the HikeWays. The teams consisted of both ‘full’ partners and

associated partners. Two of the partner organisations had long experience in EU-funded projects, while the other are newcomers to Erasmus+ or less experienced in this programme. The geographical spread was also an important factor in building this partnership - the partners come from three different countries - Poland, Romania and Slovenia - and are based in locations giving easy access to mountain ranges, where learning activities on a hike could be organised.

The Polish team involved Education Centre EST from Wadowice and a public school Centrum Kształcenia Zawodowego i Ustawicznego (CKZiU) from a nearby town Andrychów. The cooperation of the two organisations is a result of the digiHIKE project. Teachers from CKZiU enthusiastically responded to a request from EST to propagate the project among her students, many of whom joined some of the workshops and trips. A very positive feedback from the participants let us realise that it was worth involving the school in the new HikeWays project to be able to take whole classes on a hike, not only individual students. EST provided a qualified mountain guide and youth workers versatile in relevant technologies (in particular digital mapping and aerial photography). The teachers had some experience in EU-funded projects which facilitated their participation, although the school had never participated in a project of this type. EST has long EU project experience since 2003, both as partner and coordinator.

The Romanian team involved a language school, Bridge Language Study House (BLSH), and a public high school (associated partner) Apáczai Cser János Theoretical High School, both from Cluj-Napoca. BLSH proved to be an excellent partner in a project completed before so they were invited by EST to join this initiative with expert skills in facilitating foreign language and intercultural activities for young people using various innovative methods like video storytelling. Their key staff are also passionate hikers and facilitators of cultural events in the nearby villages of the mountainous region. They partnered with the Apaczai school to elaborate and implement together a programme of school hiking trips connecting explorations of the natural beauty and cultural riches of Transylvania with the development of the students' foreign language communication skills and artistic expression with the use of digital tools.

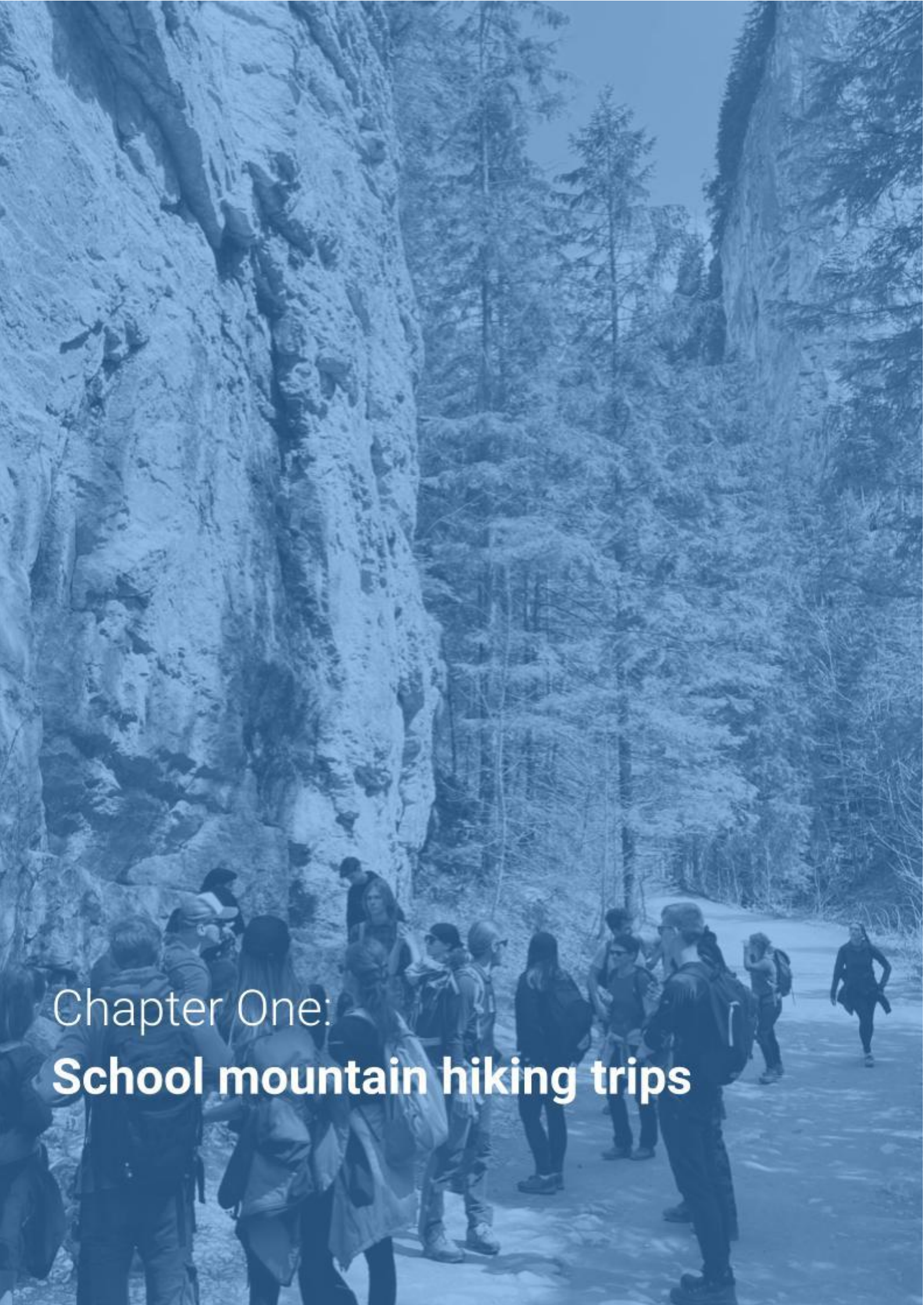
The team from Slovenia involved the Slovenian Mountain Guides Association (SMGA)and their associated partner high school Gymnazija Slovenj Gradec. We wanted to have a representation of professional mountain guides on board this project which aimed at promoting best approaches in facilitation of school hiking trips. SMGA supported us in planning and implementing interesting and safe trips for young people. They are expert users of various digital tools helping to navigate in the mountains (digital maps, tracking apps, accident reporting apps, peak finders, etc). In particular, they led the important aspect of the learning programme on digital

mapping. The teachers from their partner school happily joined the project as trips guided by SMGA ensure the best and safest way to involve young people in mountain hiking experience. The school teachers of Physics and P.E. in particular welcomed this opportunity to develop and run together an interdisciplinary programme of such excursions.

Transnational cooperation was thus an inherent part of the project seeking to encourage interest in explorations of these three neighbouring countries and their natural and cultural riches. We are all different and represent different sectors (school education, mountain guiding and youth work), still for the success of the project all this versatile experience was helpful. Each partner team organised hiking trips in parallel to the others. The trails, the visited sites and the learning programmes were different but the trips had a number of common features: mountainous regions were explored by students of similar age, having similar tasks (create annotated and illustrated maps), using similar tools (mapping software, cameras, drones) and sharing their results via the same media in the same language (English). We thus needed effective facilitation in each team to realise this programme and produce results which could 'hook' the participants into online transnational encounters.

The online exchange created a natural curiosity to visit and meet the peers in the real, and walk some of the trails promoted by them. We created such opportunities for the best motivated participants in this project. Also, the project gave our staff many opportunities for networked learning. We have built the partnership in such a way as to let the participating teachers and youth workers meet colleagues working in different cultural and educational contexts, both online and face-to-face, and learn new things which can enable them to initiate ecotourism programmes in their schools. Each partner team organised hiking trips and related lessons for school students throughout the project implementation. These activities increased the number of students taking part in such excursions with an interdisciplinary learning programme bridging subjects of Geography, Biology, Physics, English, Art and IT.

The partnership gathered a wealth of experiences in engaging young people in outdoor exploratory activities with digital tools. We believe that these experiences have the potential to influence other teachers and youth workers to launch similar initiatives and thus extend the project impact beyond the direct group of its participants. With this in view, we distilled the best trails and related learning scenarios to present them in this publication.



Chapter One:
School mountain hiking trips

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Mountain hiking is an exhilarating and challenging activity that offers a unique opportunity to explore and appreciate the natural world. For school groups, it is an excellent way to promote physical fitness, teamwork, and an appreciation for the environment. However, mountain hiking may also be demanding, and it requires proper planning and preparation to ensure a safe and enjoyable experience.

In this chapter, we will outline the basics of mountain hiking for school groups, including essential equipment, safety considerations, and strategies for a successful trip. We will also provide tips and advice for educators to help them plan and lead effective mountain hiking excursions with their students. Whether you are a seasoned hiker or a beginner, this overview will provide valuable suggestions on how to make the most of this exciting activity with your school group.

1. Essential equipment for mountain hiking

The essential equipment for mountain hiking can vary depending on the specific trail and the conditions you will encounter, but there are some basic items that every hiker should have. Here are some of the most important pieces of equipment for a school group going on a mountain hiking trip:

- Proper hiking footwear: A good pair of hiking boots or shoes with sturdy soles and good ankle support is essential to prevent injuries on rugged terrain.
- Backpack: A well-fitting backpack with enough capacity to hold water, food, extra clothing, and other essentials is crucial for a comfortable and safe hiking experience.
- Water and hydration system: Staying hydrated is critical during any physical activity, especially during a strenuous mountain hike. Bring enough water to last the entire trip, and consider using a hydration system such as a hydration bladder or water bottle with a built-in filter.
- Map and compass: Even if you are hiking on a well-marked trail, it's important to have a map and compass to help navigate in case of unexpected circumstances or getting lost.
- First-aid kit: Accidents and injuries can happen during any outdoor activity, so it's crucial to bring a well-stocked first-aid kit that includes items such as bandages, antiseptic wipes, and pain relievers.
- Sun protection: Sunscreen, sunglasses, and a hat can help protect your skin and eyes from the harmful effects of the sun during long hikes.
- Clothing appropriate for the weather: Layered clothing appropriate for the expected weather conditions, including rain gear and warm layers, is essential to stay comfortable and safe on a mountain hike.

By having these essential items, a school group can ensure they are well-equipped for a safe and enjoyable mountain hiking experience. Depending on the trail and season the list may vary. Just to give you an example, we provide an actual list that we shared with our students preparing for a 5 day trip to the Tatra mountains in the beginning of May, divided into three categories:

Clothing

- Rain jacket
- Hiking pants
- Shorts
- Warm layer
- Fleece jacket or sweater
- Active (multifunctional) underwear for hiking
- Hiking socks 3x
- Baseball cap or sun protection hat
- Regular pants or jeans (for travel)
- Pyjamas
- Underwear 5x
- Regular T-shirt 3x (long and short sleeve)
- Sweat pants or tracksuit
- Room slippers
- Light gloves and hat
- Multifuncional scarf (buff)
- Regular socks 5x

Equipment

- Hiking shoes (mid or high)
- Trainers (running shoes or casual shoes)
- Daypack (up to 30 L) with rain cover
- Headlamp or flashlight
- Sunglasses
- Suncream
- Lip balm
- Water bottle
- Mobile phone and charger
- Powerbank
- 1x laptop per group
- Hiking poles (optional)
- Wet wipes or paper tissues
- Pen and paper (notebook)

Other

- Identity card or passport (for students from abroad)
- Insurance
- Personal care accessories

And of course, the guide had a first-aid kit sufficiently equipped for this number of hikers and an expert knowledge of the trail. Digital maps of the mountain range installed on the participants' mobiles mainly served them for spatial orientation and learning the skills of navigation in the terrain with digital tools.

2. Safety tools

Safety is the most essential requirement for hiking. There are various mobile applications that can enhance safety in the mountains and help you tackle some potential accidents, injuries, illnesses, unexpected weather conditions or guide you if you get lost.

Survival Manual

The application works offline, which is important in a case of some extreme or emergency situation. However, the app doesn't have to be used in emergency situations only, but can be also very useful for whatever outdoor trips, camping, or generally learning about nature. It is very user friendly, easy to navigate and find what the user is looking for, including information on how to:

- plan and prepare for the nature trips
- how to make fire
- build a shelter
- find and prepare food, water and its purification
- find a direction using sun, shadows, stars, prepare improvised compass
- recognize and avoid dangerous animals or poisonous plants
- provide lifesaving steps and medicine that could be used
- survive in various environments – basic principles of survival in desert, tropical or cold weather

First Aid – IFRC

The app gives you access to information about first aid emergencies. There are videos, animations and simple step-by-step advice to various first aid scenarios. In addition, in their free time students can educate themselves about First Aid through interactive quizzes, which make learning fun and easy. The app is integrated with emergency numbers and also contains safety tips during severe weather conditions like hurricanes, earthquakes and tornadoes.

In addition, we recommend you to check and use also some other applications when preparing for hiking, for example:

- weather application (for example: AccuWeather or Mateoblue weather & maps)
- compass – might be already pre installed in your phone
- some national app that allows you to just by press of one button to call Mountain Rescue Services and locate you
- family locator and GPS tracker particularly in case you plan to go for a hike alone, or can be useful for teachers during the hiking trip with more people. You can create a group for all in app and see location of all in case somebody get out of the track,
- dictionary in case you hike in different country and would need help with the translation of the navigation sites or to ask other hikers or locals for help

3. Tips and advice for educators

Besides the equipment, the preparations for a school mountain hike should also take into account other considerations. A concise list, based on our experiences in the HikeWays project, looks as follows:

- Plan ahead: research the trail and conditions ahead of time, and make sure to have a detailed itinerary and emergency plan. Check weather reports and trail conditions before departing, and have backup plans in case of unexpected changes.
- Train and prepare: make sure all participants are physically prepared for the hike by gradually increasing their endurance and fitness levels. You may introduce some exercises in the PE lessons, like practising walking on similar terrain to the planned hike, and have participants carry weighted backpacks to simulate the actual hike.
- Establish safety guidelines: set clear safety guidelines and expectations for behaviour and etiquette on the trail. Make sure all participants understand and adhere to the guidelines.
- Assign roles and responsibilities: assign roles such as navigator, first-aider, and trail leader to different participants. This helps ensure everyone has a sense of ownership and responsibility, and it also helps with team building.
- Use the buddy system: you may pair participants up and have them stick together for the duration of the hike. This helps ensure that everyone is accounted for and provides mutual support and encouragement.

- Take breaks and pace the hike: make sure to take regular breaks to rest, eat, and hydrate. Pacing the hike allows participants to maintain a comfortable and sustainable pace, which is especially important for those who are less experienced hikers.
- Encourage a sense of adventure and exploration: hiking is an opportunity to explore the natural world and appreciate its beauty. Encourage participants to engage with their surroundings, ask questions, and learn about the flora, fauna, and geology of the area.

The above points are worth taking into account if the students are to have a safe and enjoyable mountain hiking experience that fosters teamwork, personal growth, and an appreciation for the outdoors.

There are many other factors worth considering that may help planning and leading effective mountain hiking excursions with school students. We propose that you consider the following ones:

- Know your group well: before planning a hike, make sure you know the physical abilities and experience levels of your group. Choose a trail that is appropriate for their skill level, and make sure everyone is prepared for the conditions they will encounter.
- Communicate clearly: communicate with parents, students, and other leaders about the hike and what to expect. Provide a detailed itinerary, safety guidelines, and a packing list well in advance of the trip.
- Safety first: make sure safety is a top priority throughout the hike. Keep an eye on the weather and trail conditions, and adjust plans as necessary to ensure everyone stays safe. Make sure everyone is hydrated, well-fed, and properly dressed for the weather.
- Use the hike as an educational opportunity: use the hike as an opportunity to teach about the environment, geology, flora, and fauna of the area. Encourage students to ask questions and engage with their surroundings.
- Have fun: hiking should be a fun and rewarding experience. Encourage students to enjoy themselves and appreciate the beauty of the natural world.
- Follow Leave No Trace principles: teach and practice Leave No Trace principles, which include minimising impact on the environment, staying on designated trails, and packing out all trash and litter.

The list is by no way exhaustive but the tips will certainly help you plan and lead effective mountain hiking excursions that are safe, educational, and enjoyable for your students.

4. Technologies that hook young people into mountain hiking

In order to raise students' interest in nature and active lifestyle we don't necessarily have to take them to the most spectacular locations, usually full of people and noise, but rather engage them in creative investigation of the natural environment. Young people's interest in digital technology is a particular occasion to foster such engagement. In the course of the HikeWays project we gathered some valuable experiences in using digital mapping, aerial photography and filmmaking that can inspire other teachers to plan and organise similar activities with their students.

Digital mapping

Digital mapping (also called digital cartography) is the process by which a collection of data is compiled and formatted into a virtual image. The primary function of this technology is to produce maps that give accurate representations of a particular area, detailing major road arteries and other points of interest. Digital mapping can

add significant value to the hiking experience, especially for young people who are interested in digital technology. Here are some ways in which this can be done.

- Navigation: Digital mapping applications such as GPS systems, mobile apps, and web-based mapping tools can help hikers navigate more efficiently and safely. Digital maps provide real-time location tracking, detailed trail information, and elevation profiles, making it easier to plan and follow hiking routes.
- Exploration: Digital maps can encourage hikers to explore new areas and discover hidden gems. Some digital mapping tools provide satellite imagery, 360-degree views, and user-generated content that can help hikers discover new trails, scenic spots, and points of interest.
- Education: Digital mapping applications can enhance the educational value of hiking by providing detailed information about the natural environment, geology, flora, and fauna of the area. Hikers can use digital maps to learn about the history, culture, and ecology of the area they are exploring.
- Social interaction: Digital mapping tools can facilitate social interaction among hikers. Some mapping apps allow users to share their hiking routes, photos, and comments with friends and other hikers, creating a sense of community.
- Safety: Digital mapping can also enhance the safety of hiking by providing real-time information about weather, trail conditions, and potential hazards such as wildlife or fallen trees. Some mapping apps also include emergency features such as SOS alerts and location-sharing with emergency services.

To sum up: by incorporating digital mapping into the hiking experience, educators and outdoor enthusiasts can create a more engaging and educational experience for young people who are interested in digital technology. It can also make hiking safer, more efficient, and more enjoyable for all.

Plenty of maps and mobile applications can be used during mountain hiking and make it easier and more interactive. Our aim here is not to provide an extensive description of all of them, but rather select those that we have tested with good results (all free to use or can be purchased for a very affordable price).

Alltrails

The app allows you to follow other users' maps and record your outdoor adventures. In addition, there are various other features and you can:

- view your hiking, running and cycling statistics at a glance
- share your hiking, running and mountain biking activities
- filter by dog friendly, kid friendly, and wheelchair friendly walking trails
- save your favourite trails

Wikiloc

The app which proved most useful in our school trips was Wikiloc. It was most commonly used by our participants who created a number of maps of their trails, illustrated and annotated them to show some interesting spots on the way and share the insights with others.There are 2 versions of the app. The free version allows users to record their own routes on a map, add waypoints, upload pictures to the itinerary or download offline maps. If you would like to follow trails of other users and use other features like live tracking or use advanced filters, you can buy a premium account.

Wikiloc has a number of excellent tutorials which can facilitate using the tool for mountain hiking. It's worth consulting these resources at each point when you encounter any difficulties or need support to activate more advanced features.

Komoot

The app, besides standard functions like planning the trips, recording own trails, offline availability, and the possibility to add pictures to your trails, it allows you to also turn by turn voice navigation, follow other users and browse highlighted favourite places of the Komoot community. However, there is only the first region for free, afterwards you have to pay for more regions.

Relive

With this app you can track your hiking trip and share it on social media with a created 3D video story through a map you went and pictures you took. It allows you also to analyse and highlight your activity – e.g. maximum speed.

Besides digital maps there are many other applications that facilitate better orientation in the terrain, especially the following ones.

PeakLens (for Android) or **PeakVisor** (for iOS)

You can find out the names of the mountains and hills around you while hiking. You only take a picture and the app compares what you see in the camera with a virtual panorama, created from a digital 3D landscape model of the Earth. The apps work also offline.

In addition, there are various similar other apps available for Android – e.g. PeakHunter and ViewRanger that work on the same principle, but their coverage or accuracy might differ based on the location where you are.

Star Walk 2

This is an exquisite stargazing application to explore the night sky through the screen of your device. You can get familiar with thousands of stars, comets, planets, constellations, and other celestial bodies only through pointing your device to the sky. You can map the sky in real time, get 3D models of constellations and other sky objects and get the latest astronomical news too.

Aerial photography

Hiking in the mountains gets a new dimension when you can take coverage of your trails from an aerial perspective and then share the pics with friends. Drone photography and filming have been a fast-growing trend in recent years and there are lots of guides available on the Internet. We provide some of the useful links that we gathered while writing this publication in the closing chapter. The objective here is to give an overview of the key areas which can be explored in more detail through these links.

If you take a group of young people on a mountain trip with a drone you get a unique opportunity to engage them in a number of tasks. First, you need to acquire a suitable device and this is best done in consultation with the young participants -

some may already know a lot about the technology and will be certainly pleased if involved in the discussions about affordable equipment. You should run preparatory sessions in which everybody needs to learn the basics of how to navigate it, take photos and shoot videos. Such sessions are best organised before the mountain hikes, somewhere in an open space, safe enough for practising. Then comes the fun of planning the trip on a trail that gives possibilities for drone flying and offers stunning views for aerial photographers. The very trip, if well prepared, will be the highlight of the whole process. When the group comes back with their aerial pics and shots they will have plenty of material for the continuation of the activities indoors - editing the material for sharing it on the Internet is also a motivating challenge.

Drones are used in many diverse contexts - agricultural, military, commercial or artistic, just to list some of their common uses. In the context of youth work they are mainly used as a hobby or for fun, which by no means excludes serious technical or artistic pursuits. Photography and filmmaking workshops will get an entirely new dimension when drones are employed because they allow us to photograph and video from an entirely new perspective.

For a photographer a drone is a high flying camera that enables you to capture unique viewpoints of various objects. Recently the cost of getting such equipment has significantly dropped which makes it possible for hobbyists to venture down this road. Apart from amazing pics that you can take, such excursions are also great fun!

Just like in the case of camera equipment, the quality of camera on-board and the flying characteristics of the drone itself vary greatly. Low-cost models will take only very basic images while the more advanced ones can lift your photos and videos to the professional level. A compromise solution is to add your GoPro that you may already have on to a drone equipped only with a basic camera.

As you start, remember that drones, easy as they are to fly, should be used with common sense and care. It is actually a big part of aerial flying. Don’t be fooled by the idea that charging the battery, downloading the app to your smartphone and firing it up is just what you need to take stunning pictures. It’s certainly more complex than that. Make sure that you start with setting up limitations on the smartphone app that runs your drone, in particular to limit the maximum height that you can fly, how far away you can send the drone, etc. Always begin somewhere wide open, for example, in a spacious backyard, and spend time to get a feel of the controls. Make sure that you’re aware of your location in relation to what’s around you. Drone cameras usually have a wide angle lens so you may easily misjudge your position when you approach trees, buildings or other objects. Be aware of the limitations of your smartphone screen!

Drones have some amazing technology that facilitates aerial photography:

- By connecting your smartphone to your remote control unit, you can exactly see on the screen what the drone is viewing. In this way you can make perfect compositional adjustments.
- Drones have extensive camera controls – auto or full manual control, RAW capture, even time-lapse.
- Their stability features are incredible - a drone can hover in one spot almost like an aerial tripod, you can take your hands off the controls and the drone will stay in that position.
- The drone can detect when its battery is getting low and will get into automatic return-to-home (RTH) mode.
- If the connection between the remote control and the machine itself is lost the same RTH mode is activated.
- Another very useful RTH feature is activated when you lose sight of your drone, which is actually quite common when it gets some distance away. In that case you can just press the RTH button and your aircraft will safely return to you.

When you master the basics of drone navigation it's time to learn how to operate the camera and take pictures and videos. You'll be very excited when you load your first images into a bigger screen and marvel at the amazing scenes that you have captured. At the first stage of aerial photography, every pic seems thrilling. But soon you'll become more sensitive to their quality and factors that influence it.

As in the case of other forms of photography, the first factor to consider is the light. Flying a drone for amazing pics is not just just heading out randomly, but rather to chase the light. Also you should be always aware of weather conditions and what they might offer. Flying in high winds is a risky business so you should rather look for calm weather than any other condition.

The in-built cameras on many affordable drones approach the quality you get with your ground level camera. The images may be surprisingly good, especially if you have been flying in good light. Even when shooting in low light you can get amazing pics for such a small camera unit with its stability features, especially panorama images emerge as something very unique. You'll also see that your drone may shoot high quality video producing fantastic aerial footage. In fact, with the resolution available on many drones it's possible to take a high quality frame directly out of the video.

When you master the skills of taking aerial photos you'll certainly love the unique views and amazing patterns in the landscape that can be captured from above. Your drone will let you get into the areas below 100 metres, not accessible to most planes and helicopters. When preparing the mountain trip you can use maps for hikers to find and choose trails that look worth exploring with the drone. If you are a ground photographer, aerial imaging will add an extra unique aspect to your photography. And don't forget how much fun it is - both during the trip and afterwards when you come home with pics and video clips that will amaze and intrigue your friends.

However, it is very important to take safety and legal precautions when organising aerial photography sessions. Flying a drone can be fun but as a drone pilot you are another user of busy skies. It's thus important that you know how to fly in a way that doesn't pose a risk to any other aircraft or people. Rules adopted to ensure safe and secure operations of drones both for commercial and leisure activities vary from country to country. Common European rules on drones were published in June 2019 to come into force as of 1st July 2020. These rules amongst others help to protect the safety and the privacy of EU citizens while enabling the free circulation of drones and a level playing field within the European Union.

The common rules aim at helping drone operators to have a clear understanding of what is allowed or not. At the same time they enable them to operate across borders. Once drone operators have received an authorization in the state of registration, they are allowed to freely circulate in the European Union. This means that they can operate their drones seamlessly when travelling across the EU.

A very useful guide on do's and don'ts when flying a drone is provided by EASA - European Union Aviation Safety Agency. This is a summary of the key points for C2 drones, relatively small devices (<4 kg) that you can fly at a safe distance from uninvolved people. These types of drones are most likely to be used on a mountain hike.

The basic requirements are the following:

- You need to be registered and to pass an online test
- If you intend to fly close to people, you need to pass a theoretical test in an entity recognised by the national aviation authority
- You should display your registration number on the drone and upload it onto the e-identification system

Other important things that you should do:

- Make sure you are adequately insured
- Check your drone before each flight
- Plan your flight
- Make sure the electronic identification and geo-awareness system of your drone is up-to-date
- Before each flight, check the limitations of the area where you want to operate, defined by the National Authority of that country, and respect them
- Familiarise yourself with the area where you want to operate your drone
- Check the weather conditions
- Keep the drone in sight at all times

- Maintain a safe distance between the drone and people, animals and other aircraft
- When flying close to people, activate the low speed mode and keep a horizontal distance from them of at least the height of the drone (1:1 rule), but never less than 5m
- Operate your drone within the performance limitations defined in the instructions provided by the manufacturer
- Inform your national aviation authority immediately if your drone is involved in an accident that results in a serious or fatal injury to a person, or that affects a manned aircraft

Things that you shouldn't do:

- Do not make changes to the drone, unless approved by the manufacturer
- Do not fly higher than 120 m from the ground
- Do not fly near manned aircraft
- Do not fly in the proximity of airports, helipads, areas affecting public safety or where an emergency response effort is ongoing
- Do not fly over sensitive or protected sites (prisons, military bases, power plants, etc.)
- Do not use the drone to carry dangerous goods
- When flying over other people's property, do not fly less than 20 m above the property without their permission
- Do not take photographs, videos or sound recordings of people without their permission
- Respect people's privacy

Overall, photography, including aerial photography, can be a great addition to a school trip to the mountains. It provides students with an opportunity to learn, explore, and express themselves creatively while taking visual record of the hike. It may help them capture the beauty of the natural environment and to preserve memories of the trip. Photography can also be used as an educational tool - e.g. by taking photos, students can learn about composition, lighting and get a broader perspective on the landscape. Photography allows students to express their creativity and develop their own unique perspective on the natural environment. It encourages them to observe their surroundings and find beauty in unexpected places. Students can share their photos on social media platforms such as Instagram, Twitter, and Facebook, which can create a sense of community and engagement with the natural environment.

Video making

Video making is another great idea for a school trip to the mountains. Here are some reasons why:

- Capturing the experience: Video making allows students to capture the experience of hiking in a more dynamic and immersive way than photography. Videos can show the movement, sounds, and atmosphere of the natural environment, which can create a more complete record of the trip.
- Storytelling: Video making can also be used as a tool for storytelling. Students can use video to tell stories about their experiences, the natural environment, or the history and culture of the area they are exploring. Video can also be used to document the journey, including the challenges of the hike.
- Learning opportunities: Video making can be used as an educational tool. Students can learn about videography, storytelling, and the principles of visual communication. They can also learn about the natural environment and the history and culture of the area they are exploring.
- Collaboration: Video making can encourage collaboration among students. Students can work together to plan, film, and edit the video, which can promote teamwork and creative problem-solving.
- Sharing: Like photography, videos can be shared on social media platforms, which can create engagement with the natural environment and inspire others to explore the mountains.

In brief, video making can be a fun and educational addition to a school trip to the mountains. It encourages creativity, storytelling, and collaboration while providing a unique record of the hiking experience.

However, every successful film is a good story well-told. This has nothing to do with stunning visuals or fancy cameras. We can boil the different elements of the classical narrative down to five essential video narrative staples:

Characters: Focus on choosing characters that are relatable and engaging, and try to make it as easy as possible for your audience to connect by emphasising obvious character traits they can relate to. Set the scene. Where are we and at what time? Who is this character? What issues, problems, goals does this character have? Why does this character have these goals? What motivates this character? How is this character going to achieve these goals? Your story can be built from this point to various obstacles and/or the conflict.

Conflict: The conflict is the challenge main characters need to solve to achieve their goals. There need to be obstacles of some sort along the way and/or one big conflict. Even smaller ones that lead to small triumphs are good to have, but still the ultimate goal has yet to be achieved.

Quest: The quest is a journey toward a specific mission or a goal. The obstacles rise and fall (or they just rise), the plot goes deeper and eventually you reach the climax.

Climax: Here is the pinnacle, the tipping point in the story where it could go well, not so well or really, really bad. In most action films this is the big fight against the ultimate nemesis.

Resolution: You've introduced the video's hero, they've faced the conflict, endured the quest, and have arrived at the resolution. Normally your protagonist has also changed in some way, made some sort of realisation, the trials your character has faced had some effect. Win or lose, your character is forever altered by the events that have taken place.

There are also different perspectives you can use to tell a story. The perspective you use will affect the tone, voice, and message of your narrative. These are the two, most commonly used perspectives of mountain/adventure filmmaking:

First Person Point of View: When your main character is telling their story in their own words, that's a first person point of view. You'll hear them use words like, "me," "my," and "I." This point of view lends a more personal feeling to your narrative, as the main character is explaining something they went through directly. That gives your narrative more credibility since your character is speaking for you. This is perfect for testimonials, stories of discovery, and day-in-the-life videos.

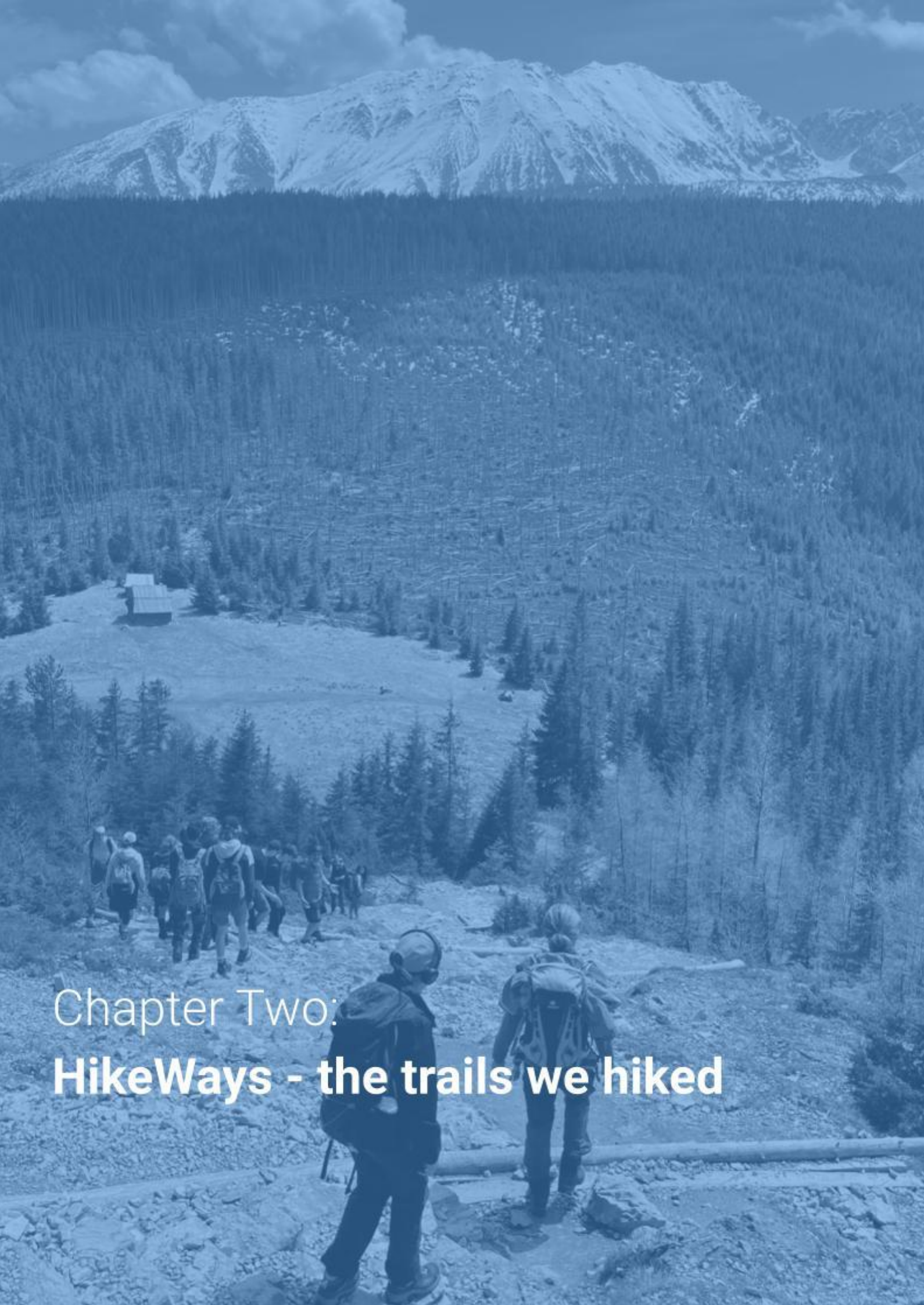
Third Person Point of View: Third person point of view is omniscient and all-knowing — there may be a narrator telling the story, or no narration at all. References to characters will be in the form of "he," "she," or "it," or more likely, will not be referenced directly at all. Think of this point of view as the silent observer. You're watching a story unfold, and the characters you're watching are unaware of your existence as the viewer. This is perfect for brand videos, commercials, product videos, and more.

Finally, here are some tips for good video storytelling:

- Work out what the story is – or at least, what the story's beginning is – before it begins. Follow it through its twists and turns until the end. And be prepared for the story to change.
- Create stories that have a beginning, middle, and an end.
- Show, don't tell. Use visuals and sound to convey the message you want to share through your story rather than stating it outright. Think about how angles, colours, audio, and more all work together to create a feeling.
- Keep things short and snappy. Don't fall into the trap of thinking that longer is better. Short stories can be just as compelling as long ones (plus they have a better chance of holding your viewer's attention from beginning to end).
- Use humour to engage your audience.

- ❖ Don’t be afraid to get creative.

One of the learning scenarios presented in the following chapter deals with video making as an educational tool. It exemplifies some of the principles only outlined here.



Chapter Two:

HikeWays - the trails we hiked

Chapter Two: HikeWays - the trails that we hiked

The idea of this chapter is to present the best trails that we followed with our students, the HikeWays as we call them in this project, and related learning scenarios that let us connect the hiking experience with the school curriculum. From each partner country - Poland, Romania and Slovenia - we present three such exemplary trails with relevant learning scenarios. They were developed by teachers from organisations participating in the HikeWays project:

- Education Center EST in cooperation with Centrum Kształcenia Zawodowego i Ustawicznego Andrychów (chapters 1 - 3)
- Bridge Language Study House (chapters 4 - 6)
- Slovenian Mountain Guides Association (chapters 7 - 9)

The choice was also meant to exemplify the relevance of outdoor exploration across the curriculum of science (in particular, Biology, Geography, Physics and IT), humanities (Language learning, History) and Arts.

The process of working on this chapter was embedded in pilot learning activities and trips with school students in the three partner countries. In this publication we are trying to give some insights into these activities through authentic photos taken by both the students and teachers. The main purpose is to encourage other school groups to follow our HikeWays or discover their own mountain trails which may offer enjoyment of hiking in the company of peers aligned with some learning experience.

1. Soblówka - Wielka Rycerzowa, Beskid Żywiecki, Poland

The Soblówka - Wielka Rycerzowa trail is a moderate route with a distance of about 12 km and 552 m of elevation gain. It starts and ends at the Church in Soblówka. Time to complete the trail, including breaks and a longer rest in a mountain hut on Mt Rycerzowa, is about 5 hours. The trail provides many beautiful and breathtaking views as well as unforgettable experiences.

HOW TO GET THERE

Soblówka is a small village located about 32 km from Żywiec, 24 km from Węgierska Górka and 56 km from Bielsko-Biała, which may make it easier to reach the destination. In the village, right next to the church, you will find quite a big and free car park. There is also a bus stop - but the bus access is very difficult so for a school trip it is a good idea to hire a bus.

WHERE TO STAY

The mountain hut on Rycerzowa is located at an altitude of 1120 m. It is the first PTTK (Polish Tourist Association) mountain hut in the Polish mountains. The hostel offers the possibility of spending the night in 2, 3, 4, 5 and 10-bed rooms. Hot meals can be ordered until 7 p.m. and the buffet is open an hour longer.

For those preferring to stay overnight in a nearby town or a village there are plenty of options to choose from. For a school trip with an overnight stay you should consider accommodation at the School Youth Hostel in Rajcza. Węgierska Górka, Milówka and Żywiec have a rich offer of small hotels, guest houses and apartments. During the tourist season we recommend booking such places long in advance as the best accommodation options will be hardly available for last minute bookings.

Check it yourself, not only on booking.com but also try a national booking portal www.noclegi.pl.

INTERESTING SPOTS ON THE TRAIL

Wielka Rycerzowa Mount is a peak belonging to the Wielka Racza Group, located in Beskid Żywiecki that is situated in the southern part of the Silesian and south-west of the Lesser Poland Voivodeship. Through the peak runs the Great European watershed Waterway (between the Baltic and Black Sea drainage basins) and the Polish-Slovakian border. For a longer trip it is worth hiking to nearby mountains: the majestic Babia Góra, rising to 1725 m above sea level which is, not counting the Tatra Mountains, the highest hill in Poland. Equally beautiful and worth climbing are the peaks of Pilsko or Mt Wielka Racza.

Nature educational path Soblówka - Rycerzowa. The primary purpose of this nature path is to familiarise tourists with the uniqueness and diversity of the Beskid flora (on which it focuses mainly) as well as the threats it is facing. It leads through naturally valuable areas covered by various forms of nature protection. The path is set along marked hiking trails from Soblówka to Hala Rycerzowa (trails: green, yellow and black). The aforementioned trails form a loop, allowing you to walk the entire

path and return to Soblówka. This location was chosen for its exceptional beauty and outstanding natural qualities. It is here that one can find many interesting plant communities characteristic of the Beskids, and also observe various transformations affecting the Beskid natural environment as a result of human activity. Students can observe the phenomena directly on the path and learn more about the surrounding nature at an exhibition in Soblówka (a branch of a centre for environmental education in Rajcza Nickulina). It is a perfect place to stop at the end of the trip.

Glade Ku Głowie is a picturesque mountain clearing on the trail, one of the places worth a stop. The steep slopes of the nearby Bednar Beskid are particularly impressive. It is a shepherd's glade and, as in many of the surrounding areas, grazes sheep. You can buy original sheep cheese produced there in the shepherd's hut on Hala Rycerzowa, also in Soblówka on return from the trail. The meadow is a great resource for a biology lesson on the plant diversity of the Beskids. The largest part of the clearing is occupied by a meadow of gladiolus and bindweed, increasingly rare in Beskid Żywiecki. The terrain in the upper part of the clearing, especially in the strip between the path the trail takes and the hut, is in turn a toma-mallow pasture. In addition to grasses, lance-leaved plantain is often found here, and in summer you can admire the numerous yellow-flowering common paperwhite, whose growth is favoured by grazing. At the upper edge of the clearing on the left, just near the border with the forest, one can notice numerous yellow flowers. This is the quadrupedal St. John's wort and the community it forms. The herb has many uses in natural medicine practised through centuries.

Przysłop Pass lies at an altitude of 940 metres above sea level separating Wielka Rycerzowa in the west and Svitkowa in the east (whose steep slopes can be climbed by the blue trail going to the left). The trail runs along the Polish-Slovakian ridge. On the Slovak side there is a small clearing. The plant communities observed here illustrate the transformations that clearings undergo today. Many of them are no longer grazed. The poorest ones are overgrown by bicolonial grasslands. They are usually built up by a few species, and the absolute dominant is an undersized grass that forms dense clumps - twin dog grass. Unused clearings undergo a process called succession. It leads to the formation of new communities in the clearings. We can observe the effects of this process in the Przysłop Pass. The local glades are gradually becoming overgrown with soft tussock and bilberry. The next stage of succession, which is perfectly visible here, is the appearance of low thickets. In this case, these are thickets of Silesian willow. This willow can be recognized by the red colour that appears on the young leaves. It is most easily observed in early spring. In addition to the willow, the scrub includes mountain ash and elderberry.

WHAT TO SEE NEARBY

Habsburg Palace - a classicist palace located in Żywiec. The residence was actually created as a result of the reconstruction of Baroque outbuildings surrounding the Old Castle. From the initial phases of construction, which resulted in the so-called Archduke Albrecht Palace, it has gone through many reconstructions, including a neo-Rococo decor clearly referring to the interiors of the famous Viennese palaces Schönbrunn and Hofburg. In 1895 the Żywiec estate was inherited by Karol Stefan Habsburg who settled in Żywiec permanently with his family and initiated the Żywiec line of the Habsburgs. The interiors of the palace feature exquisite decorations by two Kraków artists, Tadeusz Stryjeński and Franciszek Mączyński, as well as a large collection of paintings and utensils from the Habsburg period.

Brewery Museum - the Żywiec Brewery is one of the most well-known breweries in Europe. The Museum was opened in 2006 to celebrate the 150th anniversary of the brewery. It is one of the largest and most modern facilities of its kind in Poland. It is located in the brewery's former lagering cellars. After crossing the museum's gates, visitors enter a world marked by a long history of beer production there. Walking through the exhibition rooms, they learn about the successive periods of the development of the brewery and the Żywiec brand up to the present day. Beer consumption at the end of the tour isn't obviously the best idea for a school trip and this opportunity shouldn't overshadow explorations of this Monument of Technology of the Silesian Voivodeship, awarded the title of Star of Technology, also known as one of the anchor points of the European Route of Industrial Heritage, which testifies to its supra-regional importance for the industrial history of Europe.

City Museum - The Old Castle in Żywiec was built in the 16th century in Renaissance style on the site of a mediaeval castle that was completely destroyed in 1477. It now houses the municipal museum. At the museum you can learn in detail the history of the city and the Żywiec region. A short walk away is the market square - the heart of the entire town. It is here that the most important events take place, with numerous mini-concerts or some smaller events during the summer season. The market is surrounded by renovated townhouses with colourful facades. In the central point the town hall is located, built in the 19th century, and the bell tower, which was erected in the 18th century on the site of an older bell tower destroyed in a fire. Both are interesting pieces of architecture worth visiting and exploring.

Węgierska Górka is sometimes referred to as Westerplatte of the South because of the fact that for three days, from 1st - 3rd September 1939, Polish troops maintained a fierce defence against the German attack. Remaining fortifications from the Second World War are thus an important historical monument of the town. For a more relaxing time, the town has boulevards on the Soła River, a place loved by both

the locals themselves and the tourists coming here. It is a charming place, beautifully illuminated in the evenings and at night from many directions with small streams skimming by. The most important element of the entire complex and at the same time its biggest attraction is the arched bridge made of african wood suspended over the Soła River, which leads to a nearby park crisscrossed by canals. The boulevards also host the city amphitheatre used in the summer for various cultural purposes, including concerts. The amphitheatre has an original shape - its roof resembles a hat that rests on an arch referring in appearance to the one that supports the bridge over the Soła River.

Geo-Park Glinka is located in the village of Glinka (not far from Soblówka), in the municipality of Ujsoły, in the Żywiec district. It is a small border village, surrounded by the peaks of the Beskids (including Kotelnica, Jaworzyna, Solisko and Magura). It is an attraction that should be considered for a visit by anyone who likes to combine active recreation with proximity to nature. The Geo-Park includes an outdoor pool as long as 110 metres, a monkey grove, a tyrolean traverse and an outdoor climbing wall, all in an old quarry that dates back to 1927. Kids can try their hand at the easier routes of the rope park, with two levels of difficulty with 12 obstacles. For older visitors, there are three levels of difficulty with 37 obstacles to tackle. The climbing wall also offers a lot of excitement with routes of 12 and 17 metres in height, where you can climb with a rod or leading (that is, with upper or lower belay). Both amateurs and old-timers will find something for themselves. Instruction is provided by experienced instructors. All the necessary equipment is also provided on site.

SOURCES USEFUL FOR A SCHOOL TRIP PLANNING

Nature and Learning Paths in the region

A guide for the nature educational path Soblówka - Rycerzowa

The website of the PTTK mountain hut on Rycerzowa

Travel blog on mountain hiking covering the Soblówka - Rycerzowa trail

Another travel blog covering the Soblówka - Rycerzowa trail

A travel blog with insights into many other trails in the region

LEARNING SCENARIO: MY MAPS

Subjects: Geography, Biology, History, Polish (or another native language), IT
Grade Level: 8 - 10 (15 - 17 years old)
Estimated time: Developed as a 4-week project. Can be shortened or extended.

This scenario originated in connection with a school trip to Wielka Rycerzowa surrounded by the mountains of the Beskids with many trails crossing small villages and settlements, some with unique wooden architecture, as well as many places with distinct botanical features. However, the steps that we propose to follow can be adapted to other locations suited for hiking, especially in the mountains.

Materials & Technology

- Equipment suited for hiking (depending on the trail)
- Mobile phones or tablets
- PCs with Internet access, at least 1 for a small group (2 - 4 students)
- Photo editing software installed on each PC
- Projector (recommended)

Before programme begins

Agree on the whole programme of activities in a team of Geography, Biology, History, native language and IT teachers. The important aspect of the scenario is cross-curricular learning so an involvement of all these teachers will ensure comprehensive outcomes. It is likely that the trips will be led only by 1 - 2 teachers, but the preparatory and follow-up stages are best implemented if all these different subjects show their relevance for a common goal that the class is going to attain.

Activity 1: Project introduction

The learning scenario begins in a Geography class in connection with a lesson on maps. Depending on the grade the students are required to be able to use maps, including computer maps, to locate certain places and describe their characteristics as well as to use fieldwork to observe, measure and present human and physical features of their locality. The range of methods varies from less advanced (e.g. sketch maps) to a more demanding use of digital technologies as the students progress to higher levels. We begin at the stage where it is appropriate to introduce satellite navigation, GPS and GIS commonly used nowadays on computers and mobile devices.

- Divide the whole class in smaller groups (4 - 6 students). Half of the groups get paper physical maps covering their region, the other use only mobile phones, tablets or computers.
- Ask each group to locate a specific place on the maps, identify its position and measure the distance from the school. Make them also deduct any other features of the selected places - physical and human.
- The groups change the tools to compare the gathered data with the information that can be collected with the other method.
- Representatives from each group present their findings to the whole class.
- Close the lesson with challenging students with the following questions:

    - Did you get the same results?
    - Is the accuracy level the same?
    - What worked faster?
    - Which tools are more convenient?
    - Think of the advantages and disadvantages of both.

Activity 2: Planning a class trip

The places that the students had to identify on the maps in the previous session were chosen as potential destinations for a school trip. Their choice already took into account required transportation and accommodation in the case of an overnight stay as well as availability of sightseeing attractions (cultural, historic and natural). Now the students need to be involved in a shared decision about what location to

visit and explore. In our case we propose to align this session with a History lesson on the development of wooden architecture in the region but this can be easily changed and the scenario can be continued as a Geography project (geological features, natural monuments, etc.)

- Inform the students that the class is taking 1 - 2 days off school as part of an outdoor programme of activities in the vicinity. They have a say on the choice of the route and localities to explore.
- Divide the class in 3 - 4 groups and ask them to choose a place from shortlisted proposals reflecting the work conducted in the previous session. Ideally each group chooses a different place so that there is a scope for argumentation/negotiations.
- Ask the students to list characteristics of their chosen place which make it worth visiting. The search should be done on the Internet with the use of the available technology - PCs, tablets or mobile phones, deepening the initial knowledge gained from the maps.
- Facilitate a class discussion with a view to agreeing on a destination which gets most 'likes'.

    - Why is the place attractive?
    - What are its features that give insights into local traditions, customs, style of architecture, etc.?
    - Where to start the trip and which route to take to get a proper view of the locality?
    - How much time is needed to explore the place? Is the plan feasible?

Activity 3 - 4: Digital mapping technology

The scenario moves to an IT class. Most of the students are expected to be familiar with Google Maps, still perhaps only few would know specific applications for mapping routes in the terrain. Only some hikers and bikers may know digital maps for trail navigation like Wikiloc or AllTrails. The purpose of this session is to introduce this technology to all the students, giving both theoretical background and practical guidance on its use.

- Explain and demonstrate to students how Google My Maps work: how to create a customised map, add places to it, choose layers and save directions, etc.
- Divide students in smaller groups and ask them to create a map of the area which they are going to visit during the trip with marked routes, sights to explore and basic info on these places (pics and descriptions from the Internet).

- Introduce trail navigation tools (e.g. Wikiloc) and make students install the apps on one mobile device in each group.
- Do simple path recording exercises in the vicinity of the school or even on its premises if walking distances are sufficient.
- Give the students the following tasks for homework:

    - Record your path to school with Wikiloc and mark a few waypoints illustrated with pics.
    - Mark the same path on Google My Maps.
    - Calculate the distance covered and elevation gain/loss.
    - Search for interesting online trails in your area shared by others on the Internet.

Activity 5: Route mapping on a school trip

Before going on a school trip the students should have mastered basic path recording and mapping skills on their mobile devices. Now they will have an opportunity to apply these skills in practice. The places to visit on the trip had already been preselected during History, Geography or a Biology class if the trip explores natural habitat (like in the case of the above Soblówka - Wielka Rycerzowa trail). The trip's objective is to see these places in the real and document the sightseeing tour on an interactive map. It is important to plan the tour as a walk from one place to another with stops at points of interest so that the route can be reflected on the map.

- Divide the whole class in smaller groups, each having a mobile device to record the walkway (some students may not have mobile phones with sufficient parameters so be sensitive to this issue).
- Ask the groups to turn on the tracking functionality as they start walking and then place their phones in their pockets (so that the progress of the trip isn't hindered).
- When they see an interesting or characteristic point they should stop to mark a waypoint on the map and take a picture/s to illustrate it.
- The places which are in particular focus of the trip should be documented in more detail with full photographic coverage and notes on their features (the content will depend on the objectives of the trip which may relate to different school subjects, Geography, History, Biology).
- At the final destination the students finish the tracking and save their mapped paths for further elaboration in the classroom.
- On the way back it is a good occasion to discuss the learning experience:

    - What difficulties have you encountered?
    - Is it a good way to record explorations?
    - How can we improve/develop this learning path further?

Activity 6 - 7: Describing selected features

The gathered resources in the form of photographs and notes should be elaborated into consistent documentation of the visited sights. This is a possible task for a native language lesson where students practise concise informative writing to describe a place or an object seen on the trip. The fieldwork can now be extended into gathering data from the Internet or other available sources so that the students have additional material to draw on.

- Divide the class into the same groups that did the mapping on the trip. Their paths with marked waypoints provide a framework for the editing/writing tasks.
- To describe each location they should choose 1 - 3 pictures from the trip and elaborate brief notes made while visiting the place into proper informative paragraphs.
- Monitor their progress to help with editing quality texts in terms of content and style.
- At the end of the session each group delivers a presentation of their work. It is likely that the descriptions of the same places visited on the trips will differ which opens a venue for a discussion:

    - Why do we have different perspectives on the same object?
    - Where do we have information gaps?
    - How to fill them?
    - Where to search for further data? (possible homework activity)

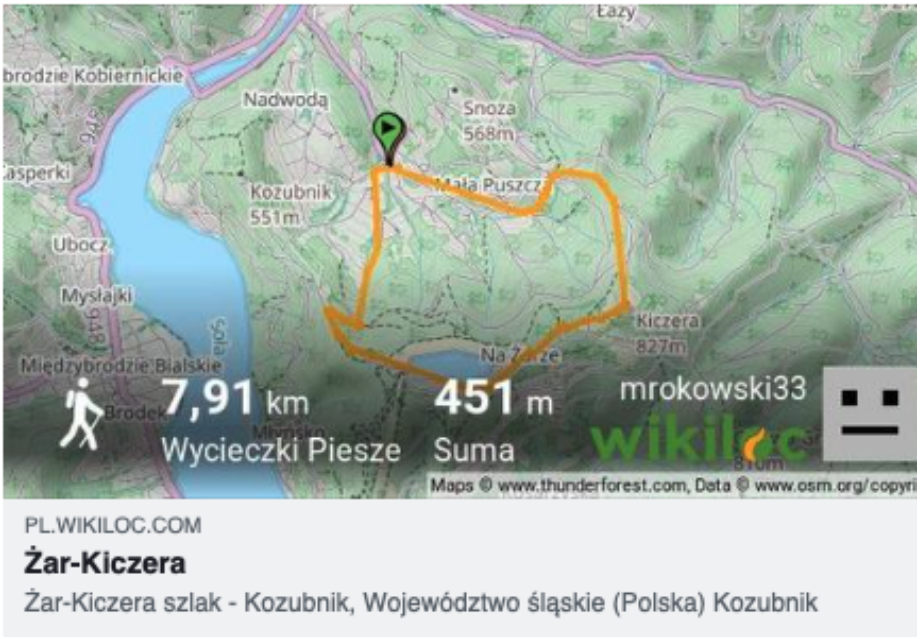
Activity 8: Updating the digital maps

This is a task for an IT class in which the students will focus on technical tasks related to illustration and annotation of their maps as well as their online presentation. At this stage all the content for the customised maps is ready - the issue is how to assemble and present it.

- Introduce photo editing software for use in class which may differ from applications used by the students on their own devices.
- Ask them to edit the photographs with which they want to illustrate the waypoints on their maps. Offer consultation on the proper format and size of the pics.
- Make them upload all the material - both pictures and descriptive texts - to relevant waypoints on the maps.
- When all the maps are finalised and saved, explain how to embed them on other portals with relevant themes.

- The whole scenario is completed with students sharing their maps with other prospective visitors of the places which they explored. This final task can lead to follow-up questions as:

    - How to best position your resources on the Internet?
    - What should you do to elicit feedback from the audiences you want to engage?
    - Where to search for relevant “communities of interest”?

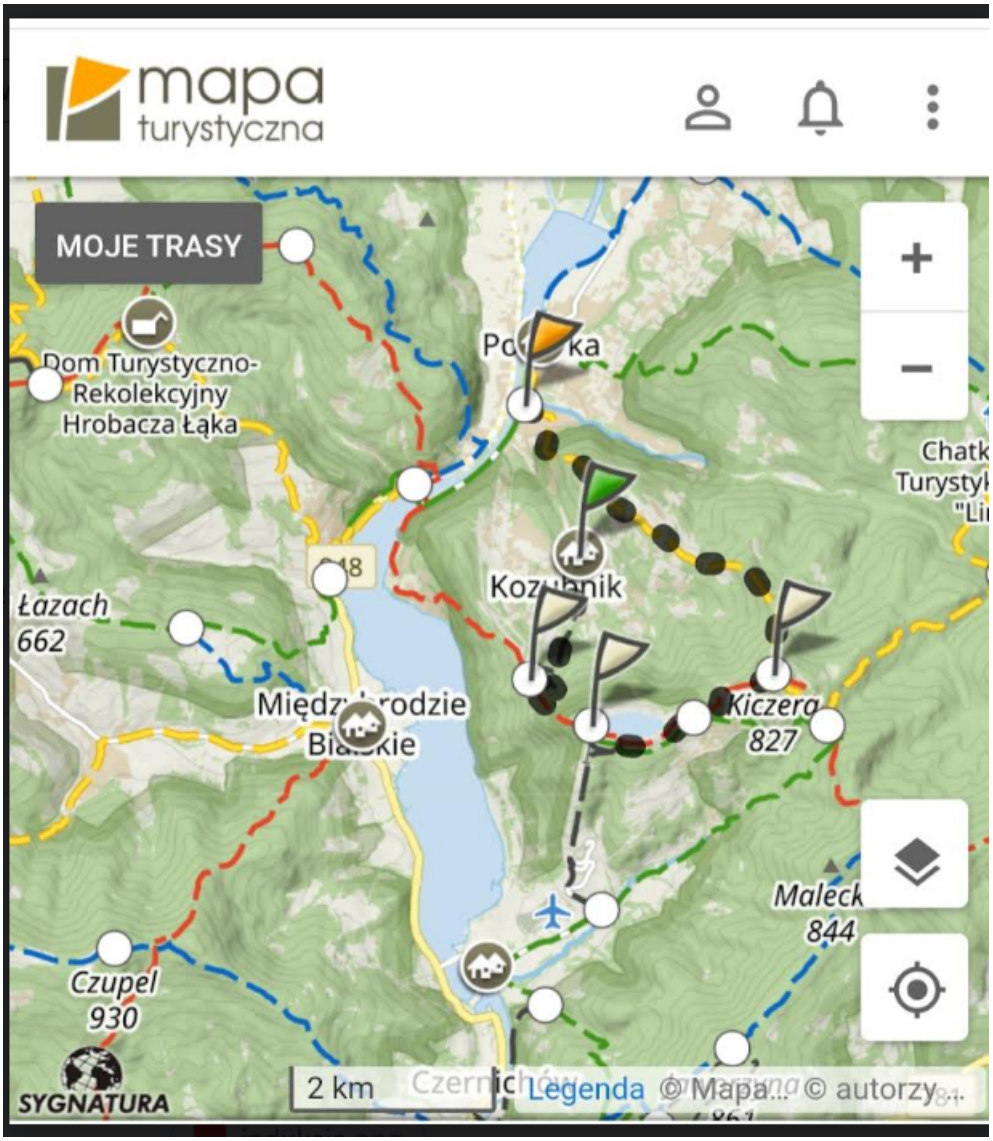


Learning outcomes: the students are able to:

- Do geographical/biological fieldwork on a mountain trail with the use of mobile devices
- Create customised maps of selected routes and places
- Develop better geographical awareness through these maps
- Share the maps online with interested users
- Explain the potential of mobile technologies for a spatial representation of localities
- Compare advantages and disadvantages of using digital maps versus paper maps

2. Kozubnik - Góra Żar - Porąbka, Beskid Żywiecki, Poland

The trail is a moderate route with a distance of about 9 km and 800 m of elevation gain. It starts in Kozubnik and ends in Porąbka. The time needed to complete the trail, excluding the visit at the power plant on top of Mount Żar, is about 3,5 hours. At the beginning the route follows an asphalt road but soon it enters the forest and leads along a black trail, very well marked. There are some steep approaches on the way to Mount Żar, but also some beautiful views on the Czaniec lake.



HOW TO GET THERE

The trail starts and ends in two different villages so the best idea for a class trip is to hire a bus which can bring the students to one point and collect from another. However, there are other options. The trail can be easily modified in such a way that the group hikes to the top of Mount Żar, where the main attraction is located and

then comes down the same way. It is possible to reach both the villages by a communal bus, unfortunately not by train. Both the villages are located about 20 km from Bielsko-Biała and there are good bus connections as both are popular tourist destinations.

WHERE TO STAY

There is no mountain hut on Mount Żar or in its vicinity but there are plenty of accommodation options in nearby towns and villages. Międzybrodzie Żywieckie excels as a resort town. The accommodation base consists primarily of small, intimate and comfortable facilities, pensions, private lodgings or guest rooms. Those looking for accommodation can also choose to stay in holiday homes or rent camping cabins.

For a school trip with an overnight stay you should consider accommodation at the School Youth Hostel in Zarzecze on the Żywieckie Lake, not far from Kozubnik and Porąbka (ca. 15 km).

During the tourist season we recommend booking accommodation long in advance as the best options will be hardly available for last minute bookings. Check it yourself, not only on booking.com but also try a national booking portal www.noclegi.pl.

INTERESTING SPOTS ON THE TRAIL

Kozubnik used to be known for years for the Recreation and Training Complex. Covering an area of 7.5 hectares, the complex was a self-sufficient resort, with its own water intake, sewage treatment plant and emergency power system. The resort is located in a stream valley and is surrounded on three sides by mountain ranges. Once a place of holiday relaxation for a large number of people, the complex has stayed abandoned and falling into disrepair for years. But a new and better page in the resort's history has begun - the revitalization of the dilapidated complex is underway, and there are plans to fill the place with tourists again! The works began in 2014, the project is divided into several stages to build several hundred apartments, a spa, swimming pools and gyms, among many other attractions. Thus the old new Kozubnik is going to amaze the world again, this time in a very modern version.

Mount Żar is a very good vantage point. From its summit you can admire the peaks of Beskid Śląski and Żywiecki and three lakes down in the valleys. However the biggest attraction is a pumped storage power plant with a water reservoir on top of the mountain. The huge reservoir is an integral part of the power plant, attracting crowds of tourists during the holiday season and on weekends.

It is the second largest hydroelectric power plant in Poland, using as a lower reservoir the Międzybrodzkie Lake while the upper reservoir, completely artificial, is built on top of Mount Żar. The location of the power plant was determined by exceptionally favourable topographic conditions: a large gradient with a small distance between the reservoirs and the possibility of using the regulated Soła River. It has the capacity of 500 MW and a drop of 440 m. It is the only underground power plant in Poland, designed to regulate the power system during peaks and load collapses. Located inside the mountain, the turbines, along with other installations, occupy a space comparable in size to a gothic church.

The power plant is designed to regulate the power system during peaks and load collapses. The short start-up of the power plant (180 sec. for generation operation) also qualifies it for emergency operation. The task of a pumped storage power plant is the conversion of electrical energy into gravitational energy of water pumped to the upper reservoir and the reverse process. Here, electricity is converted into gravitational potential energy by pumping water from the lower reservoir to the upper reservoir during periods of excess production over electricity demand (e.g., at night), and then, during peak hours, the process is reversed. This is also the basis for the economics of operating this type of plant. Electricity is bought during the period when it is cheapest, and put back into the system (sold) during the period of highest demand and at a high price. A visit at the plant is a great idea for a school trip in

connection with the physics curriculum. We provide some ideas for such a learning experience in the following scenario.

Mount Kiczera. Kiczera rises to an altitude of 827 metres above sea level. To climb it, you should follow the red trail along the power plant reservoir. At first the trail leads on an asphalt road but soon turns left onto a forest path, which leads to the summit. From the top of Kiczera, you can enjoy a beautiful view. Since Kiczera is 66 metres higher than Żar, you can admire the reservoir of the pumped storage power plant from above - a spectacular view of the powerful man-made investment. At the same time it is one of the most magnificent panoramas of the Beskid Mały. The descent to Porąbka follows the yellow trail and leads along a forest path.

Porąbka is one of the most interesting villages in the Silesian province, and its tourist attractions certainly deserve attention. The village sits in a picturesque location, spread out in the valley of the Soła River, at the foot of the Beskid Mały. Those who find accommodation here will be able to arrange interesting hiking and biking trips, and will also be able to spend time practising water sports. The lakes created on the Soła River (Międzybrodzkie and Żywieckie) are ideal for water sports. The nearby mountains are also a great place for those who want to go skiing: cross-country skiing or downhill skiing on the slopes of Mt. Żar. Porąbka is also an attractive destination for those looking for interesting objects of historical significance. One of the most important curiosities here is the Wołek Castle, the ruins of which are located on a hill towering over the village.

The most important attraction here, however, is the dam on the Soła River, which is a unique object for several reasons. It made it possible to tame the river and create Międzybrodzkie Lake. Interestingly, it was built to the design of Gabriel Narutowicz - the man who went down in history as the first president of the Republic of Poland. A hydroelectric power plant was built at this dam in the first half of the 1950s. To this day, it remains one of the greatest curiosities in this part of the country, and the opportunity to visit it makes it an attraction for school trips.

Porąbka is becoming an increasingly important tourist centre in the Beskids. Numerous resorts make it possible to find accommodation here in convenient conditions and at affordable prices. There is also a dense network of trails awaiting here, thanks to which one can easily plan excursions in the area of this village.

WHAT TO SEE NEARBY

Międzybrodzie Żywieckie is a village in the Beskid Maly in the Żywiec District, Silesian Province, 15 km from the city of Żywiec. It lies on the southern slope of Mount Żar and on the eastern shore of Międzybrodzkie Lake. The village is a recreational and sports centre, and because of its natural beauty is an ideal base for excursions into the surrounding forests and mountain trails. First of all there is the famous Mount Żar, which offers a beautiful and unforgettable view of the area. The elevation of Mt. Żar is an area of great attraction for hang-gliders and gliders. It is also home to Poland's famous Mountain Gliding School. The summit of Żar is also famous for a "paranormal phenomenon" - reverse gravity, which pulls cars upwards, which is actually an optical illusion.

Międzybrodzkie Lake is a great place for lovers of water sports, swimming and fishing. There are many beaches with playgrounds and swimming areas. This is an ideal place for family recreation. Canoes and pedal boats are quite popular - there are many water equipment rentals in the area. The sight of soaring gliders and paragliders is also an eye-catching phenomenon. The more adventurous can go paragliding with a qualified instructor and admire the picturesque panorama of the area from above.

Mountain bike enthusiasts can take advantage of the downhill trails from Mount Żar. There are three routes at different levels of difficulty: the Easy Line route with a length of 1.7 km, the AirLine route with a length of 2.3 km and the most difficult route: the Downhill route with a length of 2 km. During the summer you can also enjoy a ride on an off-road scooter, the so-called Monsterroller. The downhill runs along 2 routes: an easy one on an asphalt path, and more difficult - along the ski slope trail. It is also worth visiting the region during the winter - the ski season on Mt Żar is long thanks to artificial snow and the slope is open till late at night thanks to artificial lighting.

Czernichów is a charming communal village, located on the Soła River, between Żywieckie and Międzybrodzkie lakes. The village is surrounded on all sides by the forested hills of Beskid Mały protected as a landscape park. There are many hiking trails that lead to the hills around, including Czupel (933 m) or, in the opposite direction, Przysłop Cisowy (795 m). There are two historic buildings preserved in Czernichów which can be of interest if you plan a trip exploring the cultural heritage of the region: a brick chapel and a wooden bell tower. The chapel was built on a rectangular plan, probably in the 18th century, and covered with a nice mansard roof of shingles. Next to the chapel stands a 19th-century belfry, erected on a square plan, with a post structure. The building is also covered with a shingled roof, topped with an elegant lantern with a tent roof and a cross. The bell tower in Czernichów is a gem of wooden architecture, located on the Trail of Wooden Architecture of the Silesian Province.

SOURCES USEFUL FOR A SCHOOL TRIP PLANNING

Travel blog with a more detailed description of the trail

Another travel blog covering trails in the region

More details on Mount Żar and its attractions/trails

Power plant on Mount Żar

Mountain Gliding School

LEARNING SCENARIO: MOUNTAIN TOP POWER PLANT

Subjects: Physics, Ecology, Environmental Science
Grade Level: 10 - 12 (17 - 19 years old)
Estimated time: 5 weeks, the time may be shortened or extended depending on how the scenario is implemented

This scenario was created in connection with a school trip to Mt Żar in the Żywiec Beskids. On Żar there is a pumped storage power station with a water reservoir. It is the second largest hydroelectric power station in Poland, using as its lower reservoir Międzybrodzkie Lake, whose dam is located in Międzybrodzkie Bialskie, while the upper reservoir (completely artificial) is built on top of Żar Mountain.

The location of the power station was determined by exceptionally favourable topographic conditions: a high gradient with a small distance between the reservoirs and the possibility of using the developed Soła river.

The high-slope power station located on Mt Żar, with a capacity of 500 MW and a drop of 440 m, is the only underground power station in Poland. It is designed to regulate the power system during load peaks and dips. Below is a proposed lesson plan linked to the visit to the power station and relating to the high school Physics curriculum, in particular the topics of mechanical work, kinetic energy, potential gravity, the principle of conservation of energy and the work and power of an electric current, together with their units.

Materials & Technology

- Hiking equipment (depending on the route)
- Entrance tickets to the power station (it is advisable to book visits in advance due to the great interest of tourists in this facility)
- Computers with Internet access, at least 1 for a small group (2 - 4 students)
- Projector (recommended)

Activity 1: Introduction to pumped storage power plants

Our scenario is implemented in several consecutive Physics lessons in connection with energy topics. In the first lesson, the teacher provides an overview of pumped storage power stations and their applications in the energy industry. The topics of this lesson thus include the following:

- What are pumped storage power plants: pumped storage power plants are a type of hydroelectric power plant that use the difference in water level between the upper and lower reservoirs to store energy. They allow hydroelectricity to be converted from excess power at times of low demand

for electricity, i.e. at times when there is more energy generated than consumers need, into electricity at times of peak demand, i.e. at times when demand for electricity is higher than supply.

- How pumped storage power stations work: In a pumped storage power station, water from the lower reservoir is pumped into the upper reservoir, resulting in a build-up of potential energy. When electricity is needed, the water is released from the upper reservoir and flows through a turbine, which generates electricity. In this way, these power plants help to regulate the power in the electricity grid, thus maintaining stable access to electricity.
- How pumped storage power plants can help with renewable energy: Pumped storage power plants are used in power generation around the world to provide stable access to electricity and to compensate for variability in energy production from renewable sources such as solar or wind power. Compared to other energy sources, pumped storage power plants have high efficiency and flexibility, making them a valuable component of electricity grids.
- Divide the class into smaller groups (4 - 6 students). Each group is given the task of locating one pumped storage power station, finding out basic information about it and presenting the relevant facts to the class. This task can also be used as homework if there is not enough time in the lesson or if it is difficult to organise a class with internet access for all groups.

Activity 2: Principle of operation of pumped storage power plants

In this lesson, the teacher discusses in more detail how pumped storage power stations work in the context of explaining the concepts of kinetic and potential energy, as well as the principle of conservation of energy:

- The process of converting potential energy into kinetic energy as water flows from the upper reservoir to the lower reservoir. The water flows into a turbine, which converts the movement of the water into mechanical energy for the turbine rotor. The turbine rotor is connected to a generator, which converts the mechanical energy into electrical energy.
- When the pumped storage plant is not generating electricity, water from the lower reservoir is pumped into the upper reservoir, where it is stored as potential energy. When water is pumped, the mechanical energy from the pump motor is transferred to the water, which gains potential energy according to the principle of conservation of energy.
- When the pumped storage power station is operated during a period of peak electricity demand, the water from the upper reservoir flows down through a pipe or canal and the potential energy is converted into kinetic and mechanical energy in the turbine rotor, which drives the generator. A pumped storage power plant can operate as an AC or DC generator.

- ❖ Pumped storage power plants also use the principle of hydrostatic equilibrium, which states that the pressure in a fluid increases with depth. In a pumped storage power station, the water in the upper reservoir exerts pressure on the water in the lower reservoir, and the pressure difference between the upper and lower reservoirs causes water to flow from the upper reservoir to the lower reservoir when the power station is operating.
- ❖ In order to assess the level of understanding of the above, it is useful to prepare a set of questions that students should be able to answer, such as:

    - On which physical principles do pumped storage power stations base their operation?
    - How is the potential energy of water converted into kinetic and mechanical energy in a pumped storage power station?
    - What is a generator and how does it work in a pumped storage power station?
    - How does the principle of conservation of energy apply to pumped storage power stations?
    - What are the main advantages and applications of pumped storage power stations in the power industry?

Activity 3: Design and construction of pumped storage power plants

This lesson works best when organised in conjunction with an excursion and tour of a pumped storage power station, such as the one on Mt Żar. During this lesson, pupils will learn about the design and construction of the pumped storage power station in question. The depth of the discussion below will depend on the time available and the requirements of the physics curriculum at the respective educational level:

- ❖ Breakdown of pumped storage power plants by design
- ❖ Elements of pumped storage power plants: upper and lower reservoirs, canal or pipe, turbine, generator, pump motors, auxiliary equipment
- ❖ Methods of construction of pumped storage power plants: in particular underground, such as the power plant on Mt. Żar
- ❖ Construction of the upper and lower reservoirs, as well as their capacity
- ❖ Construction of the channel or pipe, as well as their diameter, length and slope
- ❖ Turbines and generators - their construction and operation
- ❖ Pump motors - their construction and operation
- ❖ Ancillary equipment such as culverts, gates, filters and cooling systems
- ❖ Assembly and installation of pumped storage power stations and safety procedures
- ❖ To assess the level of understanding of the above, it is useful to prepare a set of questions that students should be able to answer, e.g:

- What are the main components of pumped storage power plants?
- What are the construction methods of pumped storage power plants?
- What are the functions of the upper and lower reservoirs in a pumped storage power station?
- What are the functions of a canal or pipe in a pumped storage power station?
- What are the functions of the turbine and generator in a pumped storage power station?
- What are the safety procedures associated with the construction and operation of pumped storage power plants?
- What are the challenges associated with the construction and operation of pumped storage power plants?

Activity 4: Use of pumped storage power plants in electricity systems

After returning from the excursion, the class continues in the physics lab and takes up the important topic of electricity storage, in particular how important it is to store electricity in electricity systems, especially with variable energy sources such as wind and solar. The following topics are worth discussing:

- Fluctuations in electricity demand: when it is low, pumped storage plants store electricity by pumping water from the lower to the upper reservoir. When demand for energy increases, water is released from the upper reservoir and flows through a turbine, which drives a generator that produces electricity that is fed back into the grid.
- Energy storage for renewable sources such as wind and solar: these are variable energy sources, and pumped storage plants allow surplus energy to be stored during periods when these sources are active and returned to the grid at times when energy is needed.
- Stabilising grid voltage: during peak periods, when electricity demand is highest, pumped storage plants can provide additional energy to keep grid voltage stable.
- Electricity demand management: at times when energy is cheaper or more readily available, pumped storage plants can store energy and then release it at times when energy demand is higher and prices are higher.
- Electricity grid failures: pumped storage plants provide a reserve of electricity for the grid. In this way, they help ensure the safety and stability of the electricity grid.
- In order to assess the level of understanding of the above issues, it is useful to prepare a set of questions, or tasks for students, such as:

    - In a certain region of the country, there has been an outage on the electricity grid that has caused a significant drop in the power supplied to consumers. How can a pumped storage plant help restore power and stabilise the grid in this situation?
    - A power company owns a pumped storage power plant and wants to use it to maximise profits in a situation where electricity prices in the market vary greatly from hour to hour. How can the company use the pumped storage plant to generate more profits?

Activity 5: Ecology and hydropower

In this lesson, it is useful to link the topic of pumped storage power plants to environmental education and environmental science. At the beginning of the lesson, you need to introduce the topic by introducing the concepts of ecology and hydropower and discuss how the two are linked and why hydropower is so important for the environment and the economy. We suggest the following lesson plan:

- Environmental impact of pumped storage power stations: their advantages and disadvantages from an environmental point of view; these power stations are more environmentally friendly than coal-fired power stations, but at the same time they require large amounts of water and can affect climate change by changing water levels in lakes and rivers.

- ❖ Alternative sources of hydropower: various alternative sources of hydropower such as hydro turbines, tidal power plants, wave energy, flow energy and many others; the advantages and disadvantages of each of these technologies and their impact on the environment.
- ❖ Discussion and follow-up questions to ensure that students have assimilated the topic: it is useful to frame the questions in such a way as to encourage students to dig deeper into the topic (in a homework or team research project):

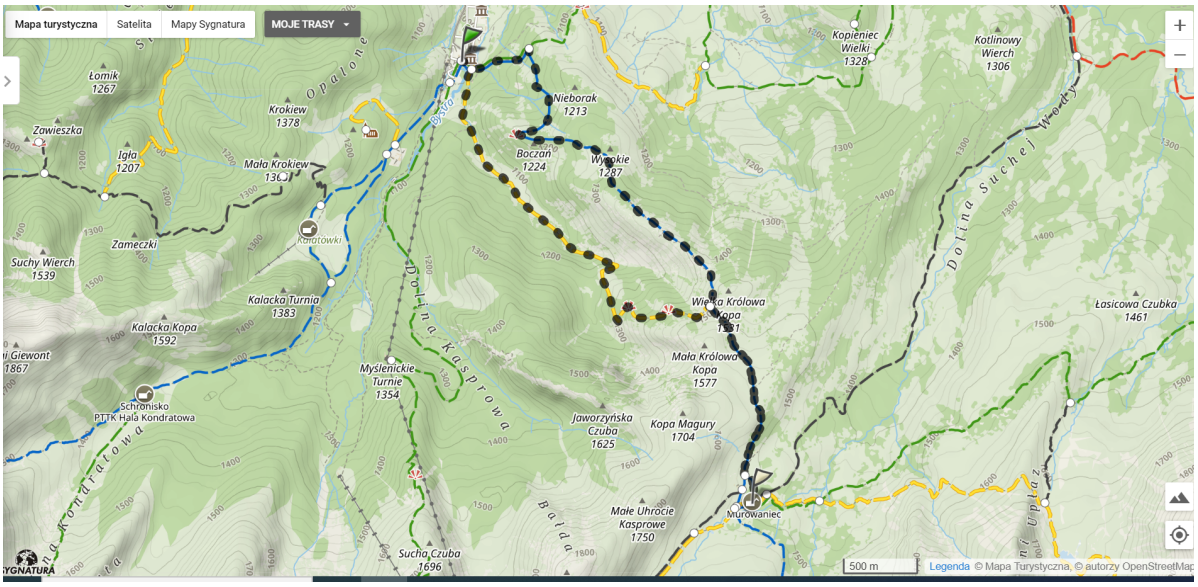
    - What are the main negative effects of the construction of pumped storage power plants on the environment?
    - Which animal and plant species are particularly vulnerable to the harmful effects of pumped storage power stations?
    - How do pumped storage power plants affect river water quality?
    - What steps are being taken to minimise the environmental impact of pumped storage power stations?
    - What are alternative energy sources that may be more environmentally friendly than pumped storage?

Learning outcomes: the students are able to:

- Describe the construction of pumped storage power stations
- Explain the principles of pumped storage power stations from a physical point of view
- Explain their role in electricity systems
- Analyse the various situations in which pumped storage power stations can be used in practice
- Evaluate the impact of pumped storage power stations on the environment
- Compare the advantages and disadvantages of pumped storage power stations from an environmental point of view

3. Kuźnice - Murowaniec, Tatra Mountains, Poland

The Kuźnice - Murowaniec - Kuźnice trail is a moderate route with a distance of 9,5 km and 637 m of elevation gain. It starts and ends near the lower station of the Kasprowy Wierch cable car. Time to complete the trail, including breaks and a longer rest in a mountain hut on Hala Gąsienicowa, is about 5 hours. We recommend this trail as an interesting alternative to a popular ride in the cable car to the top of Kasprowy Wierch in a conviction that it will offer students a range of unique sightseeing and educational experiences, in addition to the pleasures of mountain hiking in the company of friends. The proposed trail forms a loop, with a yellow one taking you up, and the blue one down, back to the spot where the hike started (the opposite direction is also possible).



HOW TO GET THERE

Kuźnice is part of Zakopane located in the northern part of the Bystra Valley in the Western Tatras, where the trails to Kalatówki, Kondratowa, Giewont, Kasprowy Wierch, and Hala Gąsienicowa begin. Zakopane, located at a distance of around 70 km from Kraków, is one of the most popular tourist destinations in Poland, that can be reached by car or bus (unfortunately not by train due to prolonged modernisation of the railway, still underway at the time of writing this publication). When you arrive in Zakopane, it is most convenient to come to Kuźnice using a bus from the main bus station or from several other stops in Zakopane. Access to the spot where the trail begins is only allowed to licensed taxis and buses, so if you come in your own bus it will have to be left in a parking lot at a walking distance of around 30 minutes from the entrance to the trail. To enter the trail you will need to buy tickets to the Tatra National park, so it is worth reminding the students to take their student IDs which will qualify the group for a reduced ticket price.

WHERE TO STAY

The Mountain Hut Murowaniec is located at an altitude of 1500 m in Hala Gąsienicowa. This place is the main hiking point for trips in the Polish Tatras and the presence of mountaineers and rock climbers would provide a great company for an overnight stay if you choose this location. The hut offers over 100 beds in smaller and bigger rooms (accommodating 2 - 10 people). Hot meals can be ordered throughout the day and boiling water for making your own tea/coffee is available free of charge (as in most Polish mountain huts). The hut has almost a 100 history partly documented on its premises, so the materials can provide a great resource for a talk with students on mountaineering in the Polish Tatras.

For those preferring to stay overnight in Zakopane or nearby villages, there are plenty of options to choose from. For a school trip with an overnight stay, you should consider accommodation not necessarily in the centre of Zakopane, which is a very commercial and expensive location, but rather in one of the surrounding villages, like Olcza, Murzasichle or Małe Ciche. Closer to the centre, in Krzeptówki, there is a cosy youth hostel that can accommodate up to 35 people in shared rooms.

Whatever you choose, remember to book accommodation long in advance as the best options will be hardly available for last minute bookings. Check it yourself, not only on booking.com but also try one of the national or local booking portals, e.g. https://e-turysta.pl/noclegi-zakopane/

INTERESTING SPOTS ON THE TRAIL

Kuźnice, where the trail starts, has a rich history that adds depth and significance to its picturesque setting. The village has played a vital role in the development of tourism and mountaineering in the region. In the late 19th century, Kuźnice began attracting attention as a starting point for expeditions into the Tatra Mountains. Adventurous climbers and nature enthusiasts recognised the area's immense potential for exploration and sought to conquer the challenging peaks. The growth of tourism in Kuźnice gained momentum with the establishment of the Tatra Society in 1873. This influential organisation aimed to protect the natural environment of the Tatras while promoting tourism and mountaineering. They played a significant role in the development of hiking trails, construction of mountain huts, and organising expeditions, contributing to the region's popularity as a destination for outdoor enthusiasts. Over time, Kuźnice evolved into a bustling hub for hikers and mountaineers, offering essential amenities and services to support their adventures. The village witnessed the construction of the Kasprowy Wierch cable car, which opened in 1936 and brought accessibility to the high-altitude areas for a wider range

of visitors. Since then, Kuźnice has remained a beloved destination for tourists, in particular welcoming crowds of skiers in the winter season.

A visit to Kuźnice, can be an opportunity to align the hiking trip with a lesson on the history of science and technology. The village's name, "Kuźnice," translates to "forges" in English, highlighting its historical association with metalworking. It used to serve as an important centre for iron production. Its strategic location amidst the dense forests of the Tatras provided an abundant supply of timber, a crucial resource for fueling the iron smelting process. The local streams also offered a reliable source of water power necessary for operating the ironworks.The iron produced in the village was of high quality and was used to create a variety of goods, including tools, weapons, and household items. The flourishing iron industry not only sustained the local economy but also contributed to the development of nearby towns and communities. However, with the passing of time and changing industrial practices, the iron industry in Kuźnice gradually declined. Despite the transition away from the iron industry, traces of its historical significance can still be found in Kuźnice. Today, the village pays homage to its roots through various landmarks and reminders of its industrial past. Visitors can explore historical sites, such as preserved smithies or exhibits that showcase the traditional ironworking techniques and tools employed by the blacksmiths of yesteryears.

Hala Gąsienicowa. The yellow trail to Murowaniec leads through a forest and will get you to a large meadow called Hala Gąsienicowa in about 1,5 hours. It is located in a stunning high-mountain valley with its wide, open space surrounded by towering peaks, creating a magnificent amphitheatre-like landscape. The sweeping panoramic views of the surrounding Tatra range, make Hala Gąsienicowa a favourite destination among hikers seeking breathtaking vistas. One of the notable features of Hala Gąsienicowa is its alpine meadows, covered with vibrant grasses and blooming wildflowers during the summer months. From the valley, hikers can embark on adventures to iconic locations like Morskie Oko, a stunning glacial lake, or climb to the summit of Rysy, the highest peak in the Polish Tatras. A feasible plan for a school trip would be to walk to Czarny Staw Gąsienicowy that can be reached from the mountain hut in about half an hour. It is a beautifully located mountain pond with spectacular views all around.

Meteorological station on Hala Gąsienicowa has existed since 1913. The observation data collected there have been used for snow and avalanche research and measurements from the very beginning. It was the first mountain meteorological station on Polish territory. Its establishment was initiated by the Natural History Section of the Tatra Society. At present, the Station at Hala Gąsienicowa is one of the most important meteorological stations in the Tatra Mountains. It represents the climatic conditions of the upper forest limit. It is situated on the slope of the Sucha Woda valley, in the cool climate floor. It is surrounded to the east, west and south by the Tatra peaks of three different physical-geographical units - the High Tatras, the Western Tatras and the Reglé Tatras - with relative heights of up to 1,000 m above valley level. A visit at the Meteorological station would provide a number of interesting educational topics, some of which we outline in the following learning scenario.

WHAT TO SEE NEARBY

Obviously the region of Zakopane offers plenty of tourist attractions. In what follows we have chosen some of those which can provide engaging topics for a school learning trip.

The Route of Wooden Architecture was established in 2001 to popularise historic wooden buildings in southern Poland and runs through the provinces of Małopolska, Podkarpacie, Świętokrzyskie and Śląskie. The trail includes sacred buildings including churches, orthodox churches, bell chapels, as well as manors, cottages, homesteads, open-air museums, granaries, villas and inns. In particular, the wooden architecture of Podhale is characterised by its unique, unrepeatable character. For centuries, there have been residential and sacral buildings built in wood or with wooden elements. The region has always been characterised by a high degree of cultural autonomy, also leading to its architecture acquiring certain characteristics: the walls of buildings are often made of tree trunks cut lengthwise in half, the roofs are usually gabled or multi-pitched, often very steep and usually covered with shingles or thatch. This style became an inspiration for a renowned Polish artist, Stanisław Witkiewicz, who gave the wooden architecture of Podhale a new dimension by adding Art Nouveau elements. He introduced rich sculptural and painting ornamentation characteristic of the regional folklore in designing villas for wealthy newcomers to Zakopane. Hence this unique style is called the Zakopane style or the Witkiewicz style. This site gives an excellent overview of the Zakopane style with a list of building worth visiting https://www.tatry-przewodnik.com.pl/blog/?miejsca-i-obiekty-styl-zakopianski

The Tatra Museum is located in Zakopane and is certainly the most important museum dedicated to the Tatra region and the history of Zakopane. The museum consists of several branches that present various aspects of the history, nature, and culture of the Tatra region. Among them is a permanent exhibition dedicated to the nature of the Tatras, showcasing unique plant and animal species found in this area. The Tatra Museum also collects collections related to the history of Zakopane and its cultural heritage. It houses exhibits related to the highlander tradition, art, craftsmanship, as well as documents, photographs, and memorabilia associated with important figures from the region's history, such as Stanisław Witkiewicz and Karol Szymanowski. The Tatra Museum also organises temporary exhibitions, lectures, workshops, and other cultural events that further enrich the offerings for visitors. It serves as an important place for learning, research, and popularising knowledge about the Tatras and the Zakopane region. For a current offer you should consult the museum's official website or contact them directly to align a museum visit with the school learning programme https://muzeumtatrzanskie.pl/ They run a programme of tailored lectures and workshops both for primary and secondary schools.

The Witkacy Theatre in Zakopane is a cultural institution dedicated to promoting the works of Stanisław Ignacy Witkiewicz, also known as Witkacy. Witkacy was a prominent Polish playwright, painter, philosopher, and art theorist. The theatre is located in a picturesque wooden building in the centre of Zakopane. It showcases a

diverse repertoire of performances, including plays written by Witkacy himself, as well as adaptations of his works by contemporary playwrights. The theatre's artistic program explores Witkacy's avant-garde and experimental style, often characterised by absurdity, psychological depth, and philosophical themes. With its unique artistic approach, the Witkacy Theatre offers a significant contribution to the vibrant cultural scene of Zakopane. They have a virtual walk on their website http://www.witkacy.pl that would give the class going on the trip an excellent preview of the forthcoming experience, if a theatre performance could be included. Obviously, this will be possible only with an overnight stay in Zakopane, which in any case is very likely if you plan a school trip there.

Ski Jump Wielka Krokiew, located in Zakopane, is a great attraction not only to sports lovers. It is an active sports facility: the hill is a part of the Olympic Preparations Centre in Zakopane. Since its inauguration in 1925, numerous ski jumping competitions and championships have been and still are held at Wielka Krokiew, e.g. Polish Ski Jumping Championships or Ski Jumping World Cup. It is worth a visit even when no sports events are held to give students a balanced programme of learning activities after the hike (as we all know, too heavy a programme of museum explorations can be a challenge for a school trip). An advantage here is that the ski jump can be explored, not only seen from the bottom. A chairlift will take you to the top of Wielka Krokiew. At the upper station of the cable car there is a café where you can sit and watch the surroundings. The view of the world from above the inrun allows you to imagine how the athletes feel before the jump, when they are sitting on the starting bar. You can also visit the judges' tower from the inside.

SOURCES USEFUL FOR A SCHOOL TRIP PLANNING

https://murowaniec.com/
https://meteor-turystyka.pl/ssm-zakopane,zakopane.html
https://obserwator.imgw.pl/tatrzanska-stacja-gasienicowa/
https://histklim.imgw.pl/pl/stations/HG
https://www.tatry.info.pl/
https://ezakopane.pl/turystyka/szlak-architektury-drewnianej/
https://www.tatry-przewodnik.com.pl/blog/?miejsca-i-obiekty-styl-zakopianski
https://muzeumtatrzanskie.pl/
http://www.witkacy.pl/pl/
https://zakopane.cos.pl/en/375/the-great-krokiew

LEARNING SCENARIO: HOW DO WE KNOW ABOUT WEATHER

Subjects: Environmental Science, Geography
Grade Level: 9 - 12 (16 - 19 years old)
Estimated time: Developed as a 3-week project. Can be shortened or extended.

This scenario originated in connection with a school trip to Hala Gąsienicowa, where a mountain meteorological station is based. The students had an opportunity to visit the site, see the instruments used for measuring various weather/climate parameters and talk to a scientist working there. We thus include this practical part in the following scenario. However, the steps that we propose below can be adapted to a situation where the trip is organised to a different meteorological station which may use a slightly different set of equipment and procedures.

Materials & Technology

- Equipment suited for hiking (depending on the trail)
- Visual aids (images or diagrams of mountain meteorological observatories)
- Handouts with key terms and discussion questions
- Possibility to see/explore the following instruments:

    - Anemometers for measuring wind speed and direction
    - Barometers for measuring atmospheric pressure
    - Hygrometers for measuring humidity
    - Thermometers for measuring temperature
    - Radiosondes or weather balloons for upper air measurement

Before programme begins

The main objective of this scenario is to let students understand the functioning of mountain meteorological observatories, the data they collect, and their significance in weather forecasting and research. In order to give the class some direct insights into how such stations function, it is advisable to locate a mountain meteorological observatory or a smaller station in a location to which a class trip can be organised. It is also a good idea to contact the scientists working there beforehand. Such places are rarely open to the public, but may be willing to give some access to their premises for educational purposes. This was the case of our hike, actually guided by a scientist from the main Mountain Meteorological Station on Kasprowy Wierch, of which the station on Hala Gąsienicowa is a branch.

Activity 1: Project introduction

The learning scenario begins in a Geography class in connection with a lesson/s on atmosphere. At the high school level the students are expected to learn (i.a.) climatological factors, distribution of air temperature, atmospheric pressure and

precipitation, general atmospheric circulation, synoptic maps, climate zones and types of climate. A hike to a meteorological observatory could be organised at the beginning of learning these topics to raise students' interest and give them a baseline understanding of how meteorological research data are collected.

- Begin the lesson by asking students if they have ever heard of mountain meteorological observatories.
- Explain that these observatories play a crucial role in studying weather patterns, climate change, and understanding the impact of mountains on local weather conditions.
- Share a captivating fact or anecdote related to mountain meteorological observatories to pique students' interest.
- Inform the students about the planned hike to a chosen observatory and challenge them with the following questions:

    - What will you see there?
    - Is everything done nowadays automatically/digitally or are there people working there?
    - What are their tasks and schedule of work?
    - What tools/instruments do they use?

Activity 2: Hiking trip to a mountain meteorological observatory or station

The choice of such a destination should take into account not only the possibility of insights into how the observatory is equipped and how it works but also practicalities like the required transportation and accommodation in the case of an overnight stay. It is also important to include other attractions in the programme (cultural, historic and natural) to let the students experience the richness of mountain hiking. A talk on the changes of the local flora and fauna in connection with climatological factors will prepare the ground for a visit at the meteorological observatory. Ideally, the visit could be organised as follows:

- Guided overview of the station. Many instruments are placed outside so before the students see the interior (not always possible as such stations are rather compact and can allow entry only of a small group of people at a time), they can get acquainted with the external infrastructure. It is likely that it will include:

    - Anemometers for measuring wind speed and direction
    - Barometers for measuring atmospheric pressure
    - Hygrometers for measuring humidity
    - Thermometers for measuring temperature
    - Radiosondes for upper air measurement

- ❖ When the students see all the instruments they can proceed to learning how the data generated by them is collected and digitally processed in the observatory. In the course of this talk they will learn some of the important terms related to mountain meteorological observatories and have an idea how they operate.
- ❖ A possible conversation with scientists working in the observatory will let the students learn their concrete tasks, roles and schedules (surprises are likely, e.g. in finding out how demanding the work may be - some of the observers work in shifts as long as 48 hours, entering data and reporting every hour).
- ❖ On the way back, encourage the students to discuss the findings in smaller groups:

    - What information do you miss to have a deeper understanding of the meaning of the work conducted there?
    - How do mountain meteorological observatories contribute to weather forecasting and climate research?
    - Why is it important to study weather conditions in mountainous regions?
    - What are the challenges of collecting data in high-altitude and extreme weather environments?

- ❖ The visit and the discussions should provide an excellent background for the following classroom learning.

Activity 3: Climate drivers determining the diversity of the Earth's climate

The primary functions of mountain meteorological observatories are to monitor and record weather conditions, collect data on temperature, humidity, wind speed and direction, atmospheric pressure, and other meteorological parameters that all contribute to studying microscale and mesoscale meteorological phenomena and the impact of mountains on weather patterns and local climate. This lesson has the purpose to explore some of the climate drivers and their impact on the diversity of Earth's climate. By understanding the various factors that influence climate patterns, students will gain a deeper appreciation for the complexity and interconnectedness of our planet's weather systems and realise how climate drivers shape different climate zones, leading to the diverse range of environments we observe around the globe. The visit at the mountain meteorological observatory will help to concretise these theoretical topics and make them easier for the students to grasp.

- Introduction to climate drivers: define climate drivers as factors that influence climate patterns on Earth; discuss the importance of studying climate drivers to understand the diversity of Earth's climate.
- Solar radiation: explain how solar radiation is the primary driver of Earth's climate; discuss how variations in solar radiation contribute to the formation of climate zones.

- ❖ Atmospheric circulation: introduce the role of atmospheric circulation in determining climate patterns; discuss how the interactions between air masses influence temperature, precipitation, and wind patterns.
- ❖ Topography and elevation: analyse examples of how mountain ranges affect climate diversity in different regions; discuss how topography and elevation influence local climate patterns.
- ❖ Climate feedbacks: introduce the concept of climate feedback mechanisms; discuss positive and negative feedback loops and their impact on climate stability and change.
- ❖ A closing discussion with the students will help them better realise:

    - How these various climate drivers determine the diversity of Earth's climate
    - The intricate interplay between solar radiation, atmospheric circulation, topography, and feedback mechanisms
    - The complex dynamics that shape the climates of different regions
    - Significant role of mountain meteorological observatories in researching these processes

Activity 4: Mountain meteorological observatories in a global research network

Mountain meteorological observatories play a crucial role within a global network dedicated to researching mesoscale meteorological phenomena. These observatories are strategically located in mountainous regions, offering unique opportunities to study and understand the intricate processes occurring in the atmosphere. By observing and collecting data on local weather patterns and phenomena, these observatories contribute valuable insights to meteorological research and aid in improving weather forecasting and climate modelling. Following the visit in a mountain meteorological observatory and having a basic knowledge of climate drivers, they students should now better understand the importance of the work conducted in such stations, at least in the following aspects:

- ❖ Data collection: mountain meteorological observatories collect comprehensive and high-quality data on various meteorological parameters, including temperature, humidity, wind speed and direction, precipitation, and atmospheric pressure. This data provides crucial information for studying mesoscale phenomena such as mountain-induced circulations, downslope windstorms, orographic precipitation, and lee waves.
- ❖ Field research: these observatories serve as a base for conducting field research, deploying specialised instruments, and conducting targeted measurements in the challenging mountainous environments. Researchers can investigate atmospheric processes specific to mountainous regions, such

as boundary layer dynamics, cloud physics, and interactions between topography and weather systems.

- Monitoring extreme weather events: mountain regions are prone to experiencing extreme weather events like blizzards, thunderstorms, and heavy precipitation. Mountain meteorological observatories play a critical role in monitoring and documenting these events, contributing to the understanding of their formation, behaviour, and impact on local and regional weather patterns.
- Climate change studies: mountainous areas are highly sensitive to climate change, experiencing accelerated warming and altered precipitation patterns. Observatories in these regions provide long-term data records necessary for assessing climate change impacts, including glacier melt, changes in snowpack, and shifts in ecological systems.
- Collaborative research: mountain meteorological observatories are part of a global network, fostering collaboration among researchers and institutions worldwide. By sharing data, knowledge, and expertise, these observatories contribute to a collective effort aimed at advancing understanding and prediction of mesoscale meteorological phenomena, ultimately benefiting weather forecasting, climate science, and societal applications.

Activity 5: Practical activities - formation of clouds

Understanding the relationship between cloud formation and atmospheric pressure changes is crucial in the study of weather patterns. Atmospheric pressure plays a significant role in determining cloud formation, and changes in pressure can influence cloud types and characteristics. As air rises or sinks in the atmosphere, it experiences changes in pressure, temperature, and humidity, which directly affect cloud development. Understanding this relationship helps us interpret weather patterns and make predictions about future conditions. Exploring the following topics in a geography lesson can provide students with insights into the dynamic nature of the atmosphere and give them a taste of experimental scientific work.

- Air pressure and cloud types: introduce students to different cloud types (e.g., cumulus, stratus, cirrus) and discuss their associated atmospheric pressure conditions. Explain that certain cloud types tend to form under specific pressure patterns. For example, cumulus clouds often form in areas of low pressure, while stratocumulus clouds may indicate stable atmospheric conditions.
- Barometric pressure observations: provide students with barometers or access to weather data indicating barometric pressure readings. In small groups, ask them to track and record pressure changes over a designated period, noting any corresponding cloud formations or changes in the sky. Encourage them to make connections between pressure readings and cloud presence or absence.

- Cloud observations and pressure maps: have students analyse weather maps showing atmospheric pressure patterns. Ask them to identify regions of high and low pressure and make predictions about cloud formation in these areas. Then, instruct them to observe and record cloud types and formations on a given day. Afterward, compare their observations to the predicted cloud formations based on the pressure maps.
- Cloud formation experiments: engage students in hands-on experiments to demonstrate the influence of pressure changes on cloud formation. One such experiment involves using a plastic bottle, hot water, and a match. Fill the bottle with hot water, seal it, and let it cool. Then, light the match and carefully introduce it into the bottle, removing it quickly. As the pressure decreases inside the bottle, students can observe the formation of a cloud-like vapour.
- Case studies and weather reports: assign students to research and analyse real-world case studies or weather reports that highlight the relationship between atmospheric pressure changes and cloud formation. They can present their findings to the class, discussing how pressure patterns influenced the formation of specific cloud types and associated weather conditions.

Learning outcomes: the students are able to:

- Describe the instruments and procedures used in mountain meteorological observatories
- Describe the main tasks of the scientists working there and explain how their work contributes to a wider research network
- Explain the crucial role they play in studying weather patterns, climate change and the impact of mountains on local weather conditions
- List and explain climate drivers determining the diversity of the Earth's climate
- Explain the relationship between cloud formation and atmospheric pressure changes

4. Cheile Turzii (Turda Gorges), Cluj county, Romania

Cheile Turzii is a natural reserve în Trascăului Mountains, Transylvania with a 1650 metres long canyon along the *Hasdate* river and impressive high walls of 250 metres. The canyon is surrounded by *Dealul Sudului (South hill)* on the left hillside and *Dealul Bisericii (Church hill)* on the right hillside which offers the possibility to do a loop trail. There are several trails that can be made in this area but our proposition is the one through the canyon and on the right hillside.

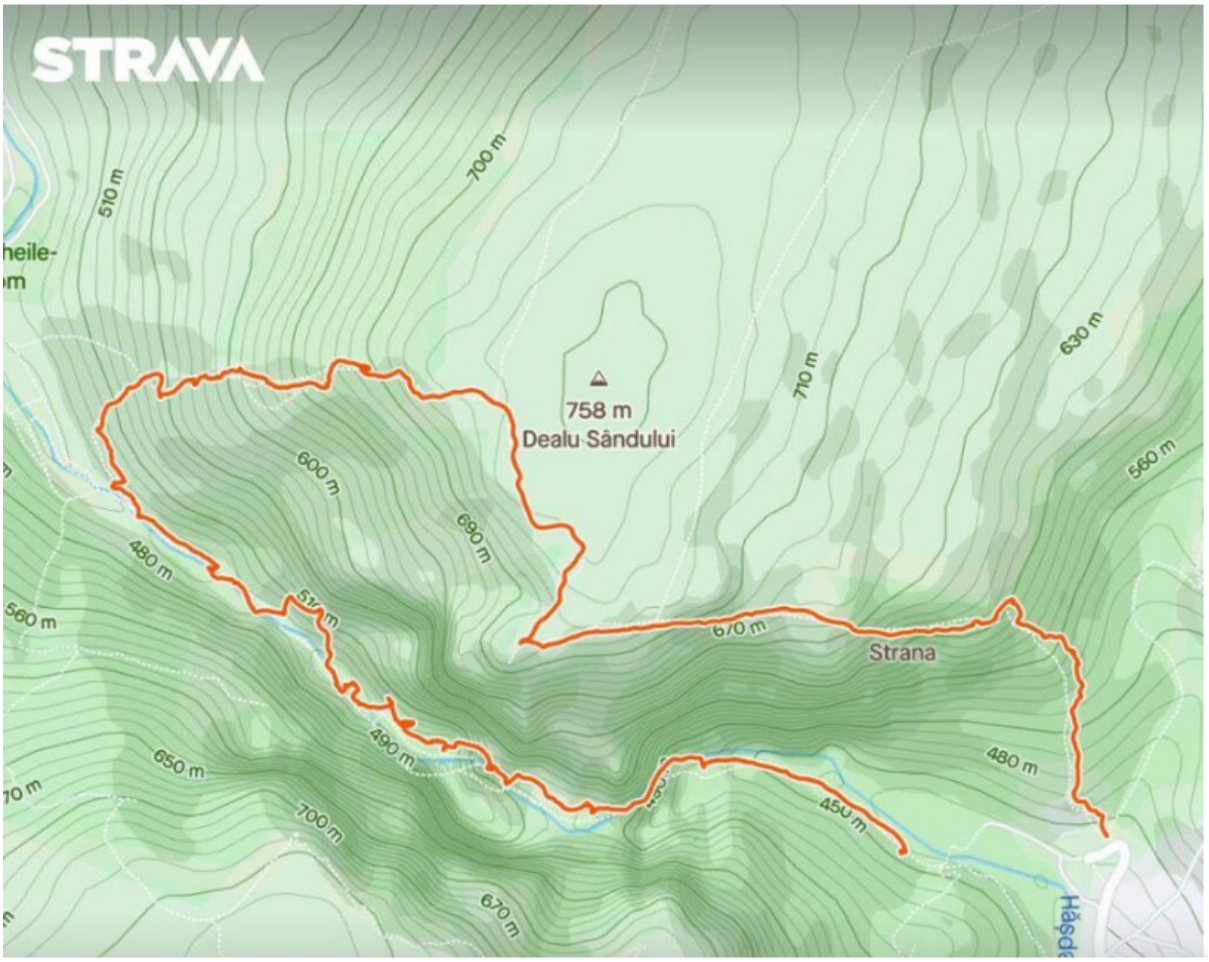
There are several possibilities to explore Turda Gorges, you can go through the canyon and follow the cool path of the river, but also explore the Gorges from the hills up and do a loop trail. For a school trip, the best route is to enter the canyon from Cheile Turzii chalet and to return following the trail on the right hillside called Dealul Bisericii or Dealu Sadului.

Distance: 5, 2 km
Elevation : 397
Time: 2 h, 40 minutes

Marking of the trail

	red line along the river in the canyon
	and then follow the red dot on the right hillside

The trail begins from the Cheile Turzii chalet and goes through the canyon along the Hasdate river following the red line marking until you reach a small valley at the opposite end where you join the red dot marking loop trail and climb up on the right hillside. Here you have the possibility to enjoy breathtaking views of the canyon from above and return to the chalet by going down on a path in the Vapa woods.



HOW TO GET THERE

Turda Gorges is situated 40 km from Cluj Napoca, the capital of Transylvania, and the easiest access point is from Turda town following the road to *Cheia* village until you reach a carpark with several terraces and souvenir shops. Depending on the time

allocated for the school trip, you can organise it with a short stop in Turda or, if you have more time, in the city of Cluj - Napoca.

TEACHING ACTIVITIES

Visiting Cheile Turzii gorges offer many teaching opportunities since it's a natural reservation with a very rich biodiversity so teachers can organise activities with direct applicability in biology, geography, ecology or tourism.
The Turda Gorge has 12 protected habitats such as tuff meadows, beech forests, rocky slopes with vegetation, Pannonian rock meadows, alluvial forests and others. There are more than 1000 species of plants and more than 100 species of animals have been identified in these habitats, some of which are protected because they are rare or endemic.

WHERE TO STAY

There are several options for accommodation near Cheile Turzii, depending on the number of students involved. There is a chalet called Cabana Cheile Turzii which is right near the entrance of Turzii Gorges and it offers low prices and accommodation both in guesthouses and wooden houses. For more details you can call +40748759063.

But there are several other options in the surrounding villages as well:
https://kereki.ro/en/services/ - Cornesti Village
https://www.pensiune-laura.ro/ - Petrestii de Jos village
http://www.pensiuneacheileapusenilor.ro/ in Sandulesti Village

INTERESTING SPOTS ON THE TRAIL

Along both trails, through the canyon and on the right hill as well, you will find informative panels presenting the rich fauna of the area (plants, butterflies and birds and their habitat).
There is even a thematic trail specially created for educational purposes for family trips or school trips. You can find the brochure of this thematic trail here: http://potaissa.org/download/juniorranger/pliantA4_detectiviinturzii_en01.jpg

WHAT ELSE TO SEE NEARBY

Turda Salt Mine, the most wanted location to visit in Transylvania, is one of the oldest salt mines in Europe, a spectacular underground formation which has now been transformed into a unique underground amusement park where you can play bowling, basketball, mini golf, football or tennis and even take a boat ride on the underground lake. For the 'ageless kids', there's a big carousel wheel.

The Turda Salt Mine is actually a complex of 5 distinct salt mines, each with its own name and story: "Terezia", "Iosif", "Anton", "Rudolf" and "Ghizela". The oldest of them, Terezia, named after Maria Theresia empress, is where tourists can go down 172 stairs or take the panoramic lift, to take a boat ride on the bottom salt lake which is set 112 metres below the surface. In the Rudolf Mine there is a spectacular underground amphitheatre (100 seats), where theatre performances or concerts are regularly organised.
For further planning you can use the official website of Salina Turda where you can find the visiting schedule, the cost of tickets and some rules of behaviour in the saltworks.
https://www.salinaturda.eu/en/locatie/salina-amusement-park/

Potaise Roman Castrum, an interesting spot to visit in Turda, especially for educational purposes, is the ruins of the legionary fortress of Legio V Macedonica from Potaissa (the Roman name of Turda) which functioned between approximately AD 170 and until the Roman withdrawal.
The castrum is one of the most important historical-archaeological monuments of Cluj county, located on the plateau called Dealul Cetății în Turda. In the middle of the 3rd century, the Roman castrum was the largest long-running legion fortress in Dacia, with about 25,000 inhabitants in the middle of the 3rd century.
The castle had a rectangular shape with long sides of 573 m and short sides of 408 m. It had a west-facing gate to higher ground, being situated on a high plateau, protected from flooding but at the same time being close enough to a stream.The water supply was built through a pipe made of terracotta tubes, with several fountains inside. The position of the castle allowed the observation of the road to Napoca (nowadays Cluj-Napoca).
Many objects have been discovered here such as coins, mosaics, stone inscriptions, etc and are exposed at the local history museum in Turda.
You can find more information about how to visit the castrum ruins here:
https://www.salinaturda.eu/en/locatie/roman-castrum/

Science Factory in Turda is an old brewery factory transformed into a science and illusions museum - a great place where children can experience science in a fun interactive way. The Turda Science Factory Museum conducts live scientific experiments with an educational role for visitors. These successfully complement the information included in the school curriculum and become a real support not only for students, but also for teachers and parents who want to try other learning methods. The Science factory is open to the public only on Saturdays and Sundays, but with prior booking the museum can be visited also during the weekdays for school trips. You can find more information here
https://www.facebook.com/fabricadestiinta/

SOURCES USEFUL FOR A SCHOOL TRIP PLANNING

https://www.cheileturzii.ro/
https://turism-cheile-turzii.ro/
https://juniorranger.ro/cheile-turzii-detectivii-naturii/
https://muntii-nostri.ro/ro/routeinfo/circuitul-cheilor-turzii
http://potaissa.org/download/juniorranger/brosura_JR2015.pdf
https://juniorranger.ro/cheile-turzii-detectivii-naturii/
https://www.salinaturda.eu/en/locatie/roman-castrum/

LEARNING SCENARIO: Teaching Through Movie Making

Subjects: Geography, History, Biology, Foreign Languages, Tourism, Creative Writing, Digital/Social Media Content Creation, Video Editing, Teacher Training etc.
Age groups/ Grades: 14+/ adults

General Description of the Movie Making Teaching Technique

It is a very adaptable, goal-oriented technique that requires putting into practice the participants' theoretical knowledge and know-how in various scenarios that closely mimic real-life situations. Through this technique the participants will develop a set of skills that can be used in numerous fields (Languages, Geography, Creative Writing, Advertising, Fiances, Social Media Content Creation and many more).

Teaching Through Movie Making is a method that aims to teach any subject through the creation of short films by the students. The core idea is simple: the students work in groups, start from a given subject, develop a plot and a script, assign the roles, act and film a short movie. The subject of the movie can be adapted to different school subjects for Mathematics, Foreign Languages to Physics, etc. and the aim is to create engagement with the subject matter in a long-lasting and organic way that the students will be able to retain and focus on long-term.

This method demonstrates how our social media focused world can be used in an educational way as an outlet for creativity and skill-building. Being aware of the downsides of the internet and all the negative impact social media has on the teenage population everywhere, but especially in Europe, the Movie Making Method aims to flip the coin and teach teenagers how to put their creativity and digital savvy to good use by helping them create educational content and making the whole process enjoyable and, last but not least, a teachable moment.

Using digital tools can be second nature to the younger generation, training teachers to use it productively, while creating engagement and passing on their knowledge in a way teenagers can relate to, is a challenge that can be met easily with this method.

The method contains different stages that can be adapted to the specific educational content it needs to deliver. The stages will be presented below, with various descriptions and examples that illustrate its versatility and adaptability when it comes to teaching a wide range of subjects.

Movie Making Method featuring HIKEWAYS

Following the advent of social media in combination with a global pandemic our sedentary lifestyle has been encouraged all the more, and getting out of one's shell is becoming increasingly more of a challenge for everyone. The aim of the HIKEWAYS programme is to create well-documented trails that can be easily accessed by school staff and students, trails that do not require expert knowledge on hiking, in order to encourage students to explore nature and discover the wonders of hiking.

Technology is an inevitable part of our lives and offers great incentives for teenagers to capture their exciting memories and unique moments. Combining these two -

hiking and creating memories in the form of digital storytelling - is a very attractive prospect to the members of the digital native generation.

Thus, the Movie Making Method provides a great opportunity for the students to immerse themselves in nature and take part in a learning experience by shooting the content of the short film while hiking. The idea is that the the main step of the technique - recording content for the film - will take place during the hike so they will be able to interact with nature, learn about the subject matter at hand (be it Foreign Languages, Physics, Biology, Arts, P.E., Tourism or even Literature) and record the learning process in the form of a short film.

This will serve as a tool and a channel that enables the trainer/teacher to transform a pleasant hike into a long-lasting learning experience for the generation that, arguably, already communicates through a version of digital storytelling (tik-tok videos, instagram stories etc.)

Materials & Technology

- hiking apparel, depending on the trail and season;
- mobile phones or/and tablets, (drones are optional but useful);
- video making, editing apps, picture processing apps
- special apps that can make you interact more actively with the environment: e.g. plant and bird identifying apps etc.

Before programme begins

The trainer will have to do a comprehensive research on the needs and interests of your students with relation to the subject you teach and the location of the hike.
To gather relevant information you can take in consideration the following elements:

- Create a rough draft, lesson plan stating the objectives of the excursion: e.g. by the end of this hike the students will be able to: 1. use descriptive adjectives to speak about nature, environment of the hike in the target language; or 2. Use Present Perfect to speak about their experiences – for English teachers ; 3. They will be able to describe the flora and fauna of the Carpathians by examining some species – for Biology Teachers.
- Do some research on the interests of each individual group. Organise a group discussion, put together a questionnaire or make an online poll that is easy to navigate and gives you concrete answers to direct questions.
- Come up with a few potential tasks they have to do during the hike. This is optional as it depends on the group dynamic. If they are a very creative group of adolescents you can make them create a story from scratch just by giving them some general keywords or instructions. e.g. Your film will have to contain the description of at least one tree/plant/rock/river etc. that you see

on your hike. If they need even more scaffolding you can come up with the whole task and make them follow detailed instructions.

Session 1 - Introduction

Explain to the participants that they will have to produce a video that has to be shot during the hike, they will have to:

- Come up with the story (if you haven't given them one already)
- Create the plot
- Assign characters
- Shoot the scenes
- Edit the video using editing tools
- Present the story in an organised viewing session

Tips for the trainer at this stage:

- make your instructions very clear and use CCQ questions (e.g. What is the purpose of this tool? What will X have to deliver with her specific role? How will you have to finish this scene?) to make sure they understand their tasks;
- make sure the aims you have set in the original lesson plan/draft are being met;
- provide additional information and background whenever necessary;
- make sure all the activities are within the range of the hiking programme:

  - the setting of the story should be in nature, wherever the trail takes you.
  - make sure they take this into account when they are planning the activities;
  - this part of the activity can be done on site or in the classroom prior to the excursion, as the trainer sees fit.

Session 2: Storytelling

At this stage the participants should be ready to start their digital storytelling journey. They will have to start creating content for the film right away.

Tips for the trainer:

- this will be a learning experience for the students in time management so you need to give them a time frame within which they will have to finish filming the scenes. Keep in mind the fact that you need to complete the hike and finish the digital storytelling project.
- assign filming, rehearsing time at every stage of the hike
- assign time for yourself as a trainer to communicate with them or pass on the knowledge they need to incorporate in their videos;
- make sure the aims are being met;
- invigilate the video making process.

Example Task:

As a group of famous hikers you have been selected by the European Council to produce a short promotional video about the area that aims to attract highschool students from other countries. Your audience of choice is highschool students who would seek a down to earth experience for the school trip they would like to organise. For the sake of research you decided to go on a hike together and explore the area. Your task is to create a video story where you present the gorge and surroundings, present the trail and what is there to be seen from a touristic point of view. You are all free to choose and develop your characters as you see fit, however you need to keep in mind that they are celebrities with strong personalities. Every member of the team should feature in the final video;

Key elements that need to feature in the video:

- ❖ one character from Transylvanian folklore;
- ❖ at least two geographical elements that stand out;
- ❖ short description of the local flora;
- ❖ at least two recommended activities they can do in the gorge.

Session 3: Editing

This usually takes place after the hike. The Participants will have to piece together all the footage in order to create the video. Usually it is recommended to organise a common viewing event where you can provide and get feedback from the participants.

Tips for the trainer at this stage:

- ❖ make sure the students know how to use the editing tools;
- ❖ give constructive feedback during and after the editing, make sure you provide substantial praise and encouragement;
- ❖ point out the actual theoretical knowledge they managed to put in practice through this experience: e.g. they have found, observed and presented a particular natural phenomenon, plant, animal species etc.
- ❖ create or provide a platform where they can access each other's work and make sure they will use the knowledge they gained through such means in future projects as well.

Learning outcomes:

- ❖ Acquiring subject matter knowledge in an engaging, interactive way that will be captured on camera and can be revisited anytime;
- ❖ Providing a structure/framework to the theoretical knowledge with which students can engage in a creative, interactive and transparent way;
- ❖ Providing a practical outlet to all the theoretical knowledge they usually receive in a traditional learning environment (classroom);

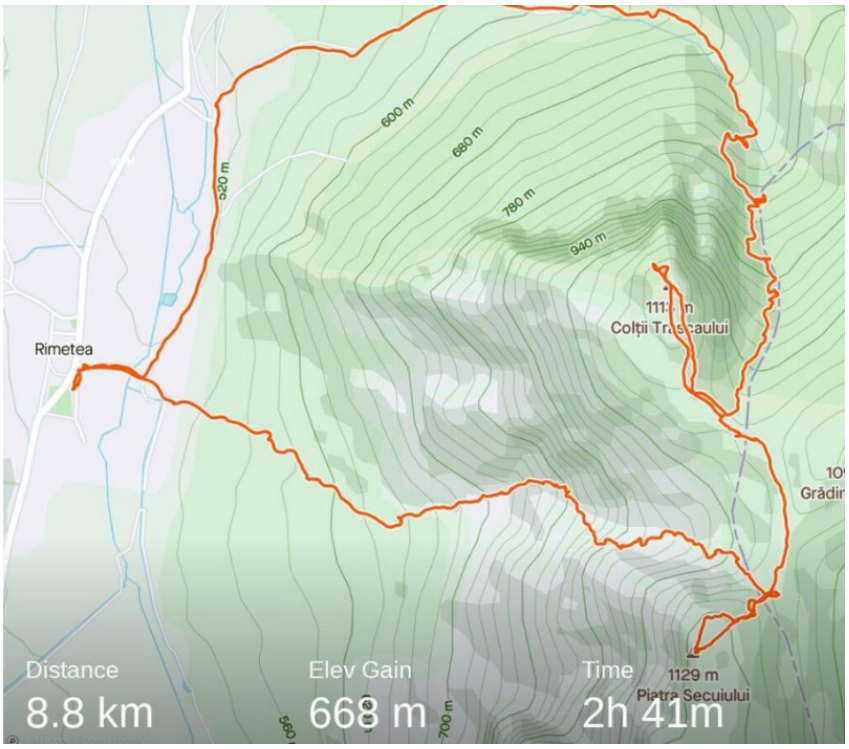
- Building practical, 21st century skills they will definitely need: e.g. video editing, reading maps, reacting to different weather conditions, interacting with nature and documenting their experiences digitally;
- Giving students incentives to leave their comfort zone and discover nature in order to build a next generation that is acutely aware of the importance of nature preservation;
- Teaching them how to use social media productively and as a useful tool; Providing opportunities that teach students how to interact with each other as members of a community.

5. Piatra Secuiului - Rimetea - Szeklers Rock, Alba county, Romania

There are two possibilities to approach the trail, depending on the season or the weather.The trail follows the blue cross and red stripe markings and you can approach it in a loop or ascent and descend directly on the blue cross marked path. Some people prefer to approach the trail directly on the blue cross path and come down through the woods on the red stripe marking, but, in case it rains, the path is very slippery and muddy.

The trail starts across the road from the Rimetea's Tourist Information Centre and you can choose to follow the red stripe marking on the left that goes up through the woods or follow the direct ascent on the blue cross path that goes up to the peak. When you reach the saddle at the top, as you come out of the forest, you will see a signpost. From that signpost you can turn right on an unmarked path, reaching after a few minutes the Colții Trascăului peak (1113 m). From Colții Trascăului you can return to the marked route to continue to Piatra Secuiului (1129 m). From Piatra Secuiului you can go down the path marked with a blue cross, which will leave you right in the centre of Rimetea village. Please note that on some parts, the path is very steep, rough, with some rocky parts.

Distance: 8, 8 km
Elevation : + 650
Time: 4 hours (moving time 2, 40 minutes)



Marking of the trail:

	Blue cross for the ascent and descent on the rocky part
	Red stripe for descending through the forest (only if it hasn't rained because it is slippery)

Wikiloc map:
https://www.wikiloc.com/hiking-trails/rimetea-piatra-secuiului-104499908

HOW TO GET THERE

Piatra Secuiului or Szekler's Rock is located in a very picturesque Unesco heritage village called Rimetea, situated 60 km from the city of Cluj Napoca în Transylvania. The village has a unique 19th century architecture. The white houses with green windows, unchanged for more than 100 years, are definitely an attraction for tourists from all over the world.

One of the most popular tourist attractions of the village is Piatra Secuiului or Szeklers Stone, also the most visited place of the Trascău Mountains, with 2 peaks known as Colții Trascăului (1113) on the northern side and on the south - Piatra Secuiului (1129 m) or Szekler's stone. That is also why it is known that, here, in Rimetea, the sun rises twice as it goes behind the rock and rises again at noon.

WHERE TO STAY

Rimetea has always been an important destination for tourists from all over the world, due to its multicultural heritage and status of a Unesco site, so there won't be any problems finding accommodation for large or smaller groups. It is a village where locals support themselves financially solely from tourism and there are plenty of options from which we recommend the following ones:

Tobias Youth Center
https://travelminit.ro/ro/cazare/centru-de-tineret-casa-tobias-rimetea
Edelweis camping site - https://cazarerimetea.ro/aloldal_en.php
Kiraly Guest house
https://casa-kiraly-vendeghaz.business.site/?utm_source=gmb&utm_medium=referral
Dr. Demeter Bela Guest house
https://travelminit.ro/ro/cazare/casa-de-oaspeti-dr-demeter-bela-rimetea

WHAT ELSE TO SEE NEARBY

Colțești Castle Fortress is located 3 km from Rimetea in the neighbouring village of Colțești, the fortress was built in 1296 as a defence after the Tatars' invasion in

1241. The fortress of Colțești belonged to the Toroczkay family, and today only a few ruins remain. The fortress is situated on a hill and offers a unique panoramic view.
Route: Colțești - Colțești Fortress - Colțești
Difficulty: easy
Duration: 1 hour walk (walking route)

The Students' Cave is a huge portal dug by wind and rain with three arches that offers some breathtaking views of the two villages Colţeşti and Rimetea. It can be accessed either as a continuation of the trail from the peak or directly from the village following the double market route with blue cross/ red triangle. If you plan to access the trail from the village on this double market route, at one point you need to follow the path to the left marked with the red triangle.

The Medieval Iron Mines. Rimetea is also known for its iron extraction history due to the German miners brought here in the 13th century which led to the village becoming one of the main iron processing centres in Transylvania. The iron ore was taken out of the mines dug in the mountains with rudimentary tools, then it was transported to the valley where it was burned in furnaces, obtaining "iron pita" which was then processed with hammers driven by the force of water, to obtain iron objects so necessary in agriculture but also in households. These abandoned old mines can be visited from the village if you follow the trail marked with the yellow triangle. 
The trail also offers a thematic path called the *Wonders of Rimetea* with educational boards on the local woods and its animals, the role of water in nature, the local fauna and its biodiversity and about iron working and processing.
https://www.alltrails.com/explore/map/minunile-de-la-rimetea-bce9abf

SOURCES USEFUL FOR A SCHOOL TRIP PLANNING

https://www.rimetea.ro/
https://turistrimetea.ro/category/trails/
https://rimetea.eu/
https://visitcluj.ro/tourist_spot/rimetea/
https://instatravel.ro/traseu-piatra-secuiului/
https://muntii-nostri.ro/ro/routeinfo/rimetea-coltii-trascaului-piatra-secuiului-coltesti-ardascheia-rimetea
https://juniorranger.ro/rimetea-minunile-de-la-rimetea/
https://whc.unesco.org/fr/listesindicatives/5683/
https://www.wikiloc.com/hiking-trails/rimetea-piatra-secuiului-104499908

LEARNING SCENARIO: Teaching English while Hiking

Subjects: English as a foreign language - ESL
Age groups/ Grades: 10 - 18 years old
Estimated time: Weekend activity or project. Can be shortened or extended.

Teaching a foreign language in a classroom has its advantages and disadvantages. One of the major drawbacks of traditional teaching is the fact that it cannot effectively mimic real-life situations. Immersive and task-based teaching have become popular methods with educators and learners of foreign languages in general. The main aim of such a method is creating opportunities for the students to use functional language in order to solve a problem while reproducing real life scenarios in which they would be required to use the language.

These methods have proven to be most efficient throughout the years yielding favourable results as they manage to put the student at ease while building the language skills and confidence required to get by in the classroom as well as in real life. However, the limitations of this method often seem to be linked to the constraints of the physical space, as conventional language learning happens in a classroom for obvious reasons.

Research and anecdotal evidence alike proves that the progress of the students is enhanced considerably if the time spent learning and practising a foreign language is deemed an enjoyable and practical occasion and the activities emulate real life situations. If that time is spent outside, while interacting with the natural world, the enjoyment factor can rise exponentially. This is the reasoning behind the Hikeways project as well. The concept is straightforward: access the best of both worlds by teaching English while hiking.

Materials & Technology

- hiking apparel, depending on the trail and season;
- digital equipment for learning (mobile phones; tablets) as well as paper based
- materials e.g. notebooks or textbooks (optional)

Before programme begins

The teacher will have to do a comprehensive research on the needs and interests of the students with relation to the topics they teach and the location of the hike. To gather relevant information one should take into consideration the following aspects. Create a rough draft, lesson plan stating the objectives of the excursion: e.g. by the end of this hike the students will be able to:

- use descriptive adjectives to speak about nature, environment of the hike in the target language;
- use Present Perfect to speak about their experiences;
- describe the flora and fauna of the Carpathians by examining some species.

These few bullet points will help you create the most suitable activities in order to insure that your students will achieve these goals:

- E.g. Do research on the interests of each individual group. Organise a group discussion, create a questionnaire or make an online poll that is easy to navigate and gives you concrete answers to direct questions.Come up with a few potential tasks they have to do during the hike.
- This is optional as it depends on the group dynamic. If they are comfortable with more creative tasks you can make them come up with a story from scratch just by giving them some general keywords or instructions.
- E.g. Your story will have to contain the description of at least one new experience, past story, character development etc. If they need more scaffolding you can provide them with the whole task and make them follow detailed instructions.

Break the ice – prepare them for the event

Explain that they will take part in an unconventional English lesson in nature. They will have to solve tasks and come up with solutions to different issues, do role play activities and describe their environment. However, as a group you must make sure everything goes by the plan and they will have to follow some instructions:

- They are in 'nature's classroom' so the classroom rules still apply (they are not allowed to leave the group or do anything that will impair their physical safely);
- They are required to use the target/English language only – with some exceptions depending on the level. You should outline these situations/emergencies when they are allowed to use their first language.
- Pre-teach vocabulary/create a digital glossary.
- Speak about the topic of the lesson briefly.
- Speak about the tasks briefly.
- Tell what you would like them to be able to do by the end of the lesson (objectives).

Tips for the teacher at this stage:

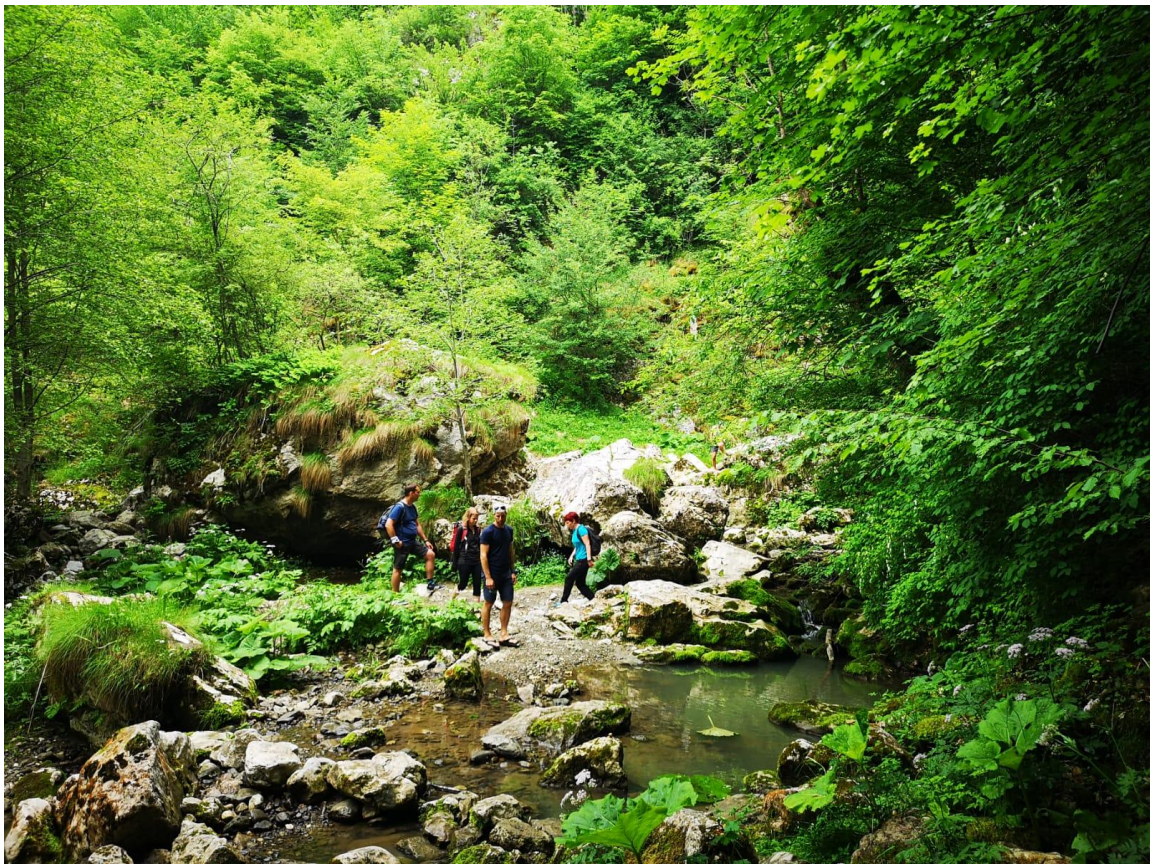
- Be clear when giving instructions and use CCQ questions to double check (Concept checking questions: e.g. What is the purpose of this tool? What will X have to deliver with her specific role? How will you have to finish this scene?)

- Make sure the aims you have set in the original lesson plan/draft are being met.
- Provide additional information and background whenever necessary.
- Make sure all the activities are within the range of the hiking programme: the setting of the activities should be in nature, wherever the trail takes you.
- Make sure they take this into account when they are planning or carrying out activities.

Session 1: Explain the task

As pointed out in the description this method can be applied at any level to teach various grammar points combined with elements of practical vocabulary. The lesson plan below aim to illustrate the versatility of this method:

- Divide them in groups of 4 max 5 students. Tell them they are in a competition with one another and they need to deliver the most unique/authentic report on the excursion.
- Tell your SS that each team is part of a scientific exploration project of a unique geographic location. They are pioneers whose task is to discover the unique characteristics of the places they are about to visit;
- They need to document their discoveries by creating a report with description and realia: videos & pictures.



Session 2: Working in groups or pairs to gather relevant information about the scenery.

The students will have to:

- Record the new information in the report form, organise it based on categories and create one relevant document for the whole group;
- Make sure they use visuals: videos and photos to illustrate their findings.

Session 3: Collecting new information

Explain that they will now have to mingle with the members of the other groups and collect new information. Each member of both groups will have to speak with every member of the other group and try to find new information gathered by their peers.

- Tip 1:Tell them to select one particular question for each person of the group so they do not end up repeating the questions;
- Tip 2: When they create the questions make sure you give them enough time and assistance, especially in the case of lower levels. You can provide a list of questions or prompts beforehand.

Session 4: Conclusion

The group reconvenes and selects all the new information they managed to gather from the other groups:

- The Ss create an outline of a presentation and a short film/tiktok/promotional video of the hiking location.
- Organise an open air presentation session at the end/during the hike and choose the winning team based on specific criteria that have been presented to the contestants.
- As a follow-up plan a classroom activity where they prepare digital presentations: short films, social media content, educational videos etc. This stage can also serve as a promotional event for other classes in order to encourage similar activities.

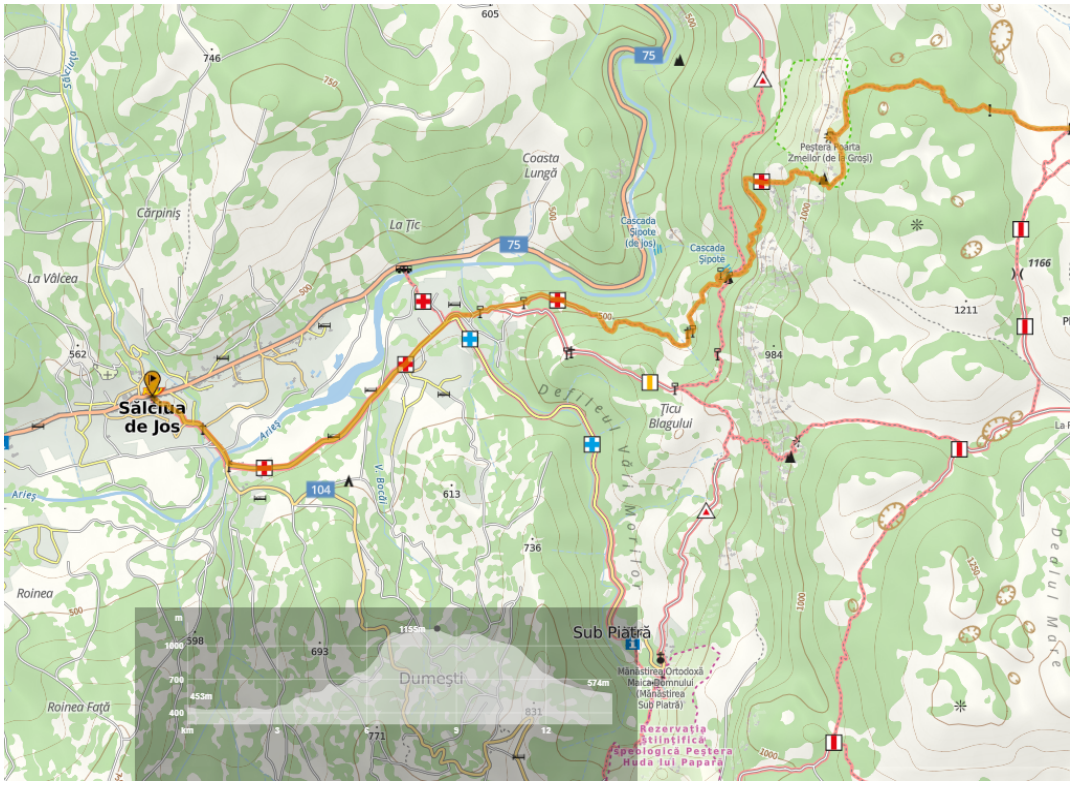
Learning outcomes: the students are able to:

- use their language skills in the 'real world' thus moving away from the rigid social construct of the 'classroom';
- learn new vocabulary and life skills while using the target language;
- build confidence in their abilities;
- implement the task-based method while making use of an authentic environment;
- illustrate and practise various grammar structures such as: causative, nuances between the modal verbs, importance of the present tenses, narrative tenses etc.

- practise ‘environmental awareness’ and providing the linguistic tools to express that awareness;
- conduct a well-informed conversation about their experience and describe the activities they took part in;
- describe the landscape ask and answer questions using the correct verb tenses: Simple Present/Past and Present Perfect;
- compare notes and state preferences;
- conduct research in the target language: practice question structures, question tags;
- practise and perfect communication in all the four skills: listening, speaking, writing (taking notes, synthesising, writing reports, organising and filtering information).

6. Sălciua - Sipote - Poarta Zmeilor - Platoul Bedeleu , Alba county, Romania

A unique and peculiar region in the Apuseni mountains is the area where the Trascau mountains have its main ridge - Bedeleu - Ciumerna - neighbouring the Salciua commune. Even if they are not considered high altitude mountains, they offer a spectacular landscape rich in biological, geological and speleology reserves: two Natura 2000 sites overlap here. The easiest and most accessible trail in this area is to go up the Bedeleu ridge and visit the travertin waterfalls and Poarta Zmeilor cave.



Trail map
https://www.wikiloc.com/hiking-trails/salciua-cascada-de-travertin-poarta-zmeilor-45192605
https://muntii-nostri.ro/ro/routeinfo/salciua-de-jos-pestera-poarta-zmeilor-izvoarele

Of course, there are more than one trail in this area and many of them intersect, depending on the starting point, but the easiest and most appropriate for a school trip would be the one following the Sipote travertine waterfall, the Dragon's gate and Bedeleu cliff where you will find a wooden a balcony which is considered to offer one of the most beautiful viewpoints in the Trascău Mountains.

Distance:12, 7 km
Elevation : + 750
Time: 4 - 5 hours

Marking of the trail: red cross 

The trail starts in the village at a wooden bridge next to which there's an area where you can leave your car or bus and start following the red cross marking route that takes you up along a thematic educational trail called "Pietrele Vorbitoare" (the whispering stones).

Our proposed approach is to follow the red cross marking that goes up to the Bedeleu ridge and return on the same route, but for some more experienced hikers groups you can do the trail in a loop and come back on the yellow stripe route. Along the trail there are many educational boards that mark the thematic trail of the whispering stones with information on the area's biodiversity and fauna, on the travertine rocks that are specific to this area which will give you a great opportunity for some stops and educational activities.

When you get to the Poiana Șipote meadow where the 5th information board is, you need to step off the trail and go to the left for a short 5 minute descent to access a wonderful travertine waterfall called Șipote waterfall. Once you go back on the red cross market trail you will start your ascent through the woods up to the Dragon's gate and Bedeleu ridge where you will have access to the wonderful panorama of Trascău mountains and its villages.

HOW TO GET THERE

The starting point for the proposed trail is Sălciua de jos village and it can be accessed either from Turda on the way to Câmpeni using the national road 75 or from Alba Iulia towards Aiud and when you get to the Buru village you turn left and join the same national road (DN 75).

WHERE TO STAY

Salciua is a commune that gathers several small villages in the area and you can find accommodation easily in any of these villages, depending whether you intend to take a large group of students or a smaller one.
For larger groups of student we recommend a camp accommodation site that hosts summer camps and training programmes - https://adeona.ro/cazare-apuseni/
But there are several other good options in the same area, all with plenty of rooms and space for outdoor activities and sports.

https://pensiuneasubpiatra.ro/en/
https://www.villagherman.ro/
https://www.poartazmeilor.ro/

TEACHING ACTIVITIES

This trail is highly recommended for school trips, but also for family trips due to the diversity of information available on the educational boards we mentioned. It is used for educational activities on the area's biodiversity that can be linked to teaching biology, but also for short insights on geology and rock formation and for discovering the characteristic habitats of this rich area.

WHAT ELSE TO SEE NEARBY

Huda Lui Papara Cave. From Salciua de jos, if you go further to the Sub Piatra village you will have the opportunity to visit the entrance of the Huda Lui Papara cave, a spectacular formation that can only be seen from outside due to the destruction of the access system. However, the wild and spectacular landscape of the area makes the cave a tourist destination for thousands of people every year.It is also known as the cave with the largest colony of bats in Europe. In 2007-2008, researchers discovered about 84,000 bats from nine species.

Scărița Belioara Natural Reservation. If you are in this area and have one more day, a must visit trail is definitely in one of the most valuable and representative reserves in the Apuseni Mountains called Șesul Craiului - Scărița Belioara. It includes the limestone plăteau Șesul Craiului, Scarița Peak (1382m) and the spectacular cliffs of the Belioara Valley. You can access it from the same road DN 75 from Turda to Campeni, but go to Posaga de Sus village. It is a 5 hour trail that can be done in a loop following the red dot marking and we recommend starting from the left because the path through the woods is easier if it is climbed upwards than the other way around. Because it is such a rich geo-botanical reservation with lots here we can find a thematic trail that consists of 6 educational panels over a distance of 1.2 km that help tourists with information about what species of rare plants and butterflies can be found in this area.

Distance:12, 5 km
Elevation : + 800
Time: 4 - 5 hours

Trail map:
https://www.strava.com/activities/3946305913
https://www.wikiloc.com/hiking-trails/scarita-belioara-104612736

SOURCES USEFUL FOR A SCHOOL TRIP PLANNING

https://turdaturism.ro/3-drumetii-bedeleu/
http://turdaturism.ro/trasee-turistice/
https://juniorranger.ro/bedeleu-pietrele-vorbitoare/
https://www.wikiloc.com/hiking-trails/cascada-sipote-balcon-poarta-zmeilor-pestera-de-la-grosi-muntii-trascau-64122799
https://amazingromania.net/circuitul-scarita-belioara/
https://juniorranger.ro/scarita-belioara-natura-in-culori/
https://www.youtube.com/watch?v=iRgaxMJgCWY

LEARNING SCENARIO: Teaching Environmental Awareness

Subjects: Environmental Sciences - Ecology
Age groups/ Grades: 10 - 18 years old
Estimated time: Weekend activity or project. Can be shortened or extended.

The climate crisis is a real threat we are facing and imminent actions need to be taken to mitigate the effects of the inevitable and reverse what can be reversed. The next generations are and should be arguably more aware of the importance of preservation and the ways in which our natural treasures and resources can and have to be maintained. The purpose of hikes and outings in nature is to demonstrate the importance of preservation and encourage the development of lifelong habits and lifestyle choices that actively prioritise environmental awareness.

Hikeways provides the best framework for such an educational activity as hiking can bring students closer to the natural world in the most realistic and practical way while accentuating the physical and mental benefits of being close to nature and the importance of looking after it, understanding different phenomena and getting acquainted with various ecosystems.

The aim of this proposed educational project is to raise awareness on different ecological processes that appear in nature, their importance in relation to our every-day existence and the way climate change disrupts these processes. To this end we have developed various activities that will enable hikers/students to create an organic relationship with their environment and develop a proactive attitude when it comes to its preservation and protection.

Materials & Technology

- hiking apparel, depending on the trail and season;
- digital equipment for learning (mobile phones; tablets) as well as paper based resources
- materials e.g. notebooks or textbooks (optional)

Before programme begins

A comprehensive pre-hike lesson is necessary in order to convey the urgency of nature preservation. The trainer/teacher can prepare a short presentation to explain how our carbon footprint already presents a destructive effect on the environment like the pollution of rivers, forests etc. through littering, excessive travel, disrupting the ecosystem: e.g. the rise in temperature results in serious damage to the local flora and fauna. The teacher/trainer must focus on the specific trail that is to be explored, selecting concrete examples of plants or animals that have been directly affected by climate disruption, pollution or other harmful human activities.

In order to illustrate the urgency and importance of eco-awareness the trainer should organise an interactive session of games designed to raise awareness on different issues e.g. the water cycle disruption (e.g. Global Change app), carbon footprint (Oroeco, Offset, Carbon Capture apps,) and have a discussion on how to minimise and monitor their own impact (Water Wiz app https://www.plt.org/educator-tips/science-apps-middle-high-school-students/

Break the ice – prepare them for the event

Explain that they will take part in an unconventional lesson in nature. They will have to solve tasks and come up with solutions to different issues, observe, monitor and describe their natural environment. However, as a group, the teacher/trainer must make sure everything goes by the plan and they will have to follow some instructions:

- They are in 'nature's classroom' so the classroom rules still apply (they are not allowed to leave the group or do anything that will impair their physical safely);
- Pre-teach vocabulary/create a digital glossary.
- Listen to and collaborate with their teammates.
- Participate in all the activities actively.
- Tell what you would like them to be able to do by the end of the lesson (objectives).

Tips for the teacher at this stage:

- Be clear when giving instructions and use CCQ questions to double check (e.g. Concept checking questions: e.g. What is the purpose of this tool? What will X have to deliver with her specific role? How will you have to finish this scene?)
- Make sure the aims you have set in your original plan are clear for them.
- Provide additional information and background whenever necessary.
- Make sure all the activities are within the range of the hiking programme: the setting of the activities should be related to the ecosystem of the specific trail you are following.

Session 1: Explain the task

Explain that they will need to take up the role of researchers who have been tasked with outlining and presenting the status of the ecosystem of this specific trail. They will have to document their findings with pictures, videos and online research. Their end result should be an eco-awareness of the trail. This can take up a digital form (powerpoint presentation, video collage, social media material etc.) and/or a physical poster/collage.

- Divide your class in three groups and explain to them that they will have to

research, find data and then present their findings on three different topics.

- Hand out the topics and allow them a few minutes to discuss what they already know about these topics, take notes, find online information about it and allow for questions and clarification. Be concise and concrete in explaining what they will need to achieve.
- N.B. when forming the groups and distributing the topics keep in mind their interests and try to assign the topics accordingly.

The research topics should be:

- Group 1: Describe *the cycle of water* in nature while illustrating it with various pictures and videos taken on site. Focus on how it can be affected by unwanted human practices: pollution and rising average temperatures specific to this trail.
- Group 2: Document (with pictures/videos, interview experts/locals etc.) *the flora* of the area and ways in which one can minimise the disruption of polluters and climate change.
- Group 3: Document (with pictures/videos, interview experts/locals etc.) *the fauna* of the area and ways in which one can minimise the disruption of polluters and climate change.

Session 2: Working in groups to gather relevant information about the ecosystem of the trail.

The students will have to:

- Record the new information they find online;
- Make a detailed research plan, depending on their topic and the material they have gathered so far;
- Create tasks and roles within the groups: one student responsible for gathering images, presenting evidence, analysing the evidence etc.
- Practise using the apps that will assist them in finalising the tasks:
  E.g. Group 1: Global Change, Carbon Foot Oroeco, Offset, Carbon Capture
  Group 2: Trees Pro, LeafSnap
  Group 3: Merlin Bird ID, eBird, Seek, iNaturalist

Session 3: Collecting data in nature

This part is the one taking place in nature when they spent most of their hiking time collecting data, observing natural phenomena, documenting the fauna and flora of the chosen trail.

- Tip 1: Keep a tight schedule, give them a certain amount of research time at

every stage of the hike. Keep it structured and efficient.

- Tip 2: Make sure that every participant is aware of their task and adequately involved in every step of the research process.
- Tip 3: Make sure you allow them question time and a few minutes to reflect on what they have gathered before they move on to the next stage of the hike.

Session 4: Conclusion

- The groups reconvene after the hike in order to reevaluate and reorganise the gathered information and create a presentation on their findings.
- The students create an outline of a presentation and a short film/powerpoint presentation, collage, poster.
- Organise an event where the groups can present their findings. Set up a jury of specialists that will prepare questions for the participants and rate the answers to these questions.
- Select a winning team based on a point system that assesses their research, the quality/impact of their presentation and their ability to answer the questions put forth by the jury.
- As a follow-up plan organise a classroom activity where they prepare digital presentations: short films, social media content, educational videos etc. This stage can also serve as a promotional event for other classes in order to

encourage similar activities;

Learning outcomes: the students will be able to:

- to create and deliver a detailed research plan both on a theoretical and practical level;
- gather information about natural phenomena, life cycles and ecology in a practical way;
- build confidence in their abilities;
- to encourage the development of a healthy and sustainable relationship with nature;
- practise 'environmental awareness' use the adequate the linguistic tools to express that awareness;
- practise critical thinking and researching skills;
- develop time management and risk analysis skills;
- enhance their presentation skills and debating skills;
- form a lifestyle that is more environmentally conscious.

7. Slovenj Gradec - Castle Vodriž, Carinthia, Slovenia

The trail from Gimnazija Slovenj Gradec to castle Vodriž is around 11 km long and on the trail you gain more than 300 m elevation. Time to complete the trail, including breaks and two longer rests for food, is around 8 hours. The trail leads across beautiful nature and it provides many opportunities for explorations. Don't be afraid to step off the trail to map out your own 'hikeway' to the castle, which we set as a destination for our school trip.

HOW TO GET THERE

First you have to reach the Carinthia region of Slovenia which is located by the border to Austria. Drive to Slovenj Gradec. It is located in the Mislinja Valley at the eastern end of the Karawanks mountain range, about 45 km west of Maribor and 65 km (40 mi) northeast of Ljubljana. You can park anywhere in the city and take a nice walk around. The centre of the city is very beautiful and quite small. You will easily find the starting point of the trail, Gimnazija Slovenj Gradec. You can even have a guided tour of the high school if you step inside.

WHERE TO STAY

When you come to Slovenj Gradec, there are some possibilities where you can stay. For big groups, the Hotel Slovenj Gradec is a good option. A lot of sports teams stay here when they come to train in our excellent sports infrastructure.
http://www.hotelslovenjgradec.si/

For smaller groups (10-12 people) Vila Pohorje is the more intimate choice:
http://vilapohorje.si/

You can stay at one of the tourist farms. We recommend Farm Lešnik which is situated 5 km from the town centre. Experience Great home-cooked food, maybe you are for adventure and you would like to learn to cook Slovenian dishes or sleep in *kozolec*?
https://www.facebook.com/people/Ekolo%C5%A1ko-turisti%C4%8Dna-kmetija-Le%C5%A1nik/100054508207745/

Perhaps Hostel Slovenj Gradec is a good choice for you. It is a clean, new hostel with friendly staff. https://www.koroska.si/hostel-slovenj-gradec

INTERESTING SPOTS ON THE TRAIL

Vodriž castle was built around 1300 in a gothic style. The castle today belongs to the immovable monument of national importance, proclaimed on October 6th, 1999. Castle Vodriž or Hermit's castle is one of the mightiest castles remaining in Slovenia. Its two residential towers are preserved as well as some residential houses, a part of the walls, and a chapel on the first floor with a three-octave ending.

Sports airport Slovenj Gradec where you can see some of the sports planes and gliders. The instructors can inform you about everything involved in learning how to fly. Or do you want to jump from a plane? https://www.kas-aeroklub.si/

Exhibition about doctor Ljuba Prenner in the village Inn Bučinek. He was an advocate and an important Slovenian writer. Who was Ljuba Prenner? https://en.wikipedia.org/wiki/Ljuba_Prenner)

Kajuh district cyclostyle technique was named after the fallen poet Karel Destovnik Kajuh. During the period between the Second World War and the occupation between 1941 and 1945, the leadership of the Slovenian resistance within the organisation Osvobodilna Fronta (OF) placed great emphasis on agitation and propaganda, especially the printed word, as they counted on mass involvement of the population in resistance activities. For this purpose, in addition to regular larger printing houses, many smaller secret ones were established on Slovenian territory. In the partisan jargon, these smaller secret printers were called technics. They worked in bunkers, usually in the woods, and each had its secret name. The technical staff was made up of a group of partisans who had their tasks precisely distributed among them.
https://www.travel-slovenia.si/slo/location/okrozna-ciklostilna-tehnika-kajuh/

The green path with a story from Podgorje to the castle of Vodriž or Wiederdries is a school learning path that was established by the Podgorje Primary School near Slovenj Gradec in 2016. It is a circular path, and along the way we try our hand at mathematical, natural science and literary tasks, presented on information boards along the way. The route offers many activities, such as sports and nature days. In the embrace of nature, you can walk through forests, meadows, forest roads, past farms and ponds, while at the same time offering a wonderful view towards Pohorje and Uršlja Gora. You can enjoy the wind blowing, the sounds of nature and the sounds of forest animals.
https://www.travel-slovenia.si/slo/location/zelena-pot-z-zgodbo/

WHAT TO SEE NEARBY

Mežica mine is located near the main road leading from Mežica to Črna na Koroškem. It used to be one of the last lead-zinc mines in Europe that was still operating at the end of the 20th century. In more than three hundred years of operation, it had a significant impact on life outside the mine in the entire area of Mežica Valley. After the mine production had been closed, its rich technical, cultural and natural heritage was opened for touristic, educational, research and study purposes. The mine museum offers crafts and entrepreneurship activities utilising

the potential of historical knowledge, authentic mining equipment and facilities. On its 20th anniversary, the museum received an award for good cooperation with schools on various curricular and extracurricular activities, letting students explore the fields of mining, geology, ethnology, history, occupational safety and educational science. Tourists can choose different ways of visiting the mine: by train, bike or even kayak. The most popular way is a ride on a genuine mining train right to the heart of the mine. After a 15 minutes ride, tourists leave the train and follow a trail to find out more about the history of mining through numerous exhibited objects. Another option is to ride a bike on a 5 kilometres long underground path through the abandoned and mysterious mining tunnels. Finally, the most adventurous way of the mine explorations is by kayak. The visitors receive all the necessary protective equipment and special kayaks for two to three persons each. Following a guide, they paddle along a small underground river to reach spectacular lakes almost 700 m below the surface.

Črna na Koroškem, a tiny town in the northern region of Koroška, is worth visiting for many reasons. It is there where you can experience the longest zip line in Slovenia. The Olimpline runs from Navrški Vrh hill above Črna na Koroškem down to the town's ski slopes to end near the Kogelnik farm, with a 200-metre difference in altitude. Those brave and eager enough to experience an adrenaline rush will need around a minute to complete the ride, in which they will be able to reach speeds of up to 120 km/h. Besides this attraction, the town has a beautiful park of King Matjaž and, in winter, castles made out of ice and snow. In the town's vicinity there is the spectacular Topla alpine valley, protected as a natural park, with unique fauna and flora that can provide research topics for a biology school curriculum.

Baroque manor Bukovje near Dravograd, built in the 18th century, is situated between the flatlands on the right bank of the river Drava and the green hillside of Pohorje with the mysterious ruins of the Roman castle. Nowadays it is a seat of various cultural activities and events taking advantage of its beautiful natural environment, the castle's park with old trees and newly planted vegetation, as well as its rich cultural heritage with well preserved remnants of the baroque era. Accordingly, this venue provides a platform not only for different social and entertainment events but also for exhibitions and educational activities. The manor is on the path of the international cycling trail along the river Drava and offers accommodation for cyclists and other tourists. A great option for a school hiking trip would be to rent bikes there and cycle a path along the Drava valley with some gorgeous views of the nearby mountains.

Carinthian Gallery of Fine Arts in Slovenj Gradec is a museum of visual arts, focusing on the collection and study of art from the second half of the 20th century onwards. The current collection features more than 3000 works by many foreign and

domestic artists. The Museum also maintains a special collection which comprises international works of art that have a particularly contemporary and engaged position, such as those dealing with war, migration, social inequality and similar. Particular attention is devoted to contemporary artists, especially those from the region as well as artists from across Slovenia. In addition to exhibitions the gallery provides guided tours, educational classes, workshops and lectures for groups. The activities are addressed to all age groups, from preschool to upper high school. Children and youths can discover and explore works of art with the help of learning assignments that encourage them to think and observe. Guidance and classes include a detailed introduction to the chosen topic, a collection or current exhibition, which may be followed by a short creative workshop. Through artistic expression students can develop their observation skills, understanding and experience of art.

SOURCES USEFUL FOR A SCHOOL TRIP PLANNING

https://en.wikipedia.org/wiki/Slovenj_Gradec

https://www.gim.sc-sg.si/

https://www.travel-slovenia.si/location/castle-vodriz/

https://www.podzemljepece.com/?lang=en

https://english.sta.si/2782293/longest-zip-line-in-slovenia-to-be-launched

https://dravabike.si/en/services/jz-dravit-dravograd

https://www.glu-sg.si/en/

https://www.kas-aeroklub.si/

https://bucinek.si/domov/spominska-soba-dr-ljube-prenner/

https://www.travel-slovenia.si/slo/location/okrozna-ciklostilna-tehnika-kajuh/

https://www.travel-slovenia.si/slo/location/zelena-pot-z-zgodbo/

LEARNING SCENARIO: GREEN EXPLORER CHALLENGE

Subjects: Biology, Geography, PE, IT
Grade Level: 8 - 10 (14 - 16 years old)
Estimated time: Developed as a practical upgrade of regular school curriculum

School trips are organised every year throughout the school education. Usually we take students to some interesting towns, museums, architectural wonders and try to widen their understanding of the world and parts of the school curriculum. We often go around like tourists. And those places have their content packed in very interesting products in order to sell it. But, is this the only way to go around? We think that it is not.

We explore distant places but we forget about the environment that we live in. And there is a lot to discover. A lot of content to build around the home environment. These trips are cheaper, easier to organise and have the chance to spark interest in activities around home.

We put in this hike lessons elements of Biology, Geography, PE and IT. But you can expand this project also with other subjects, Environmental Science, History and …

We planned our hike from our school in Slovenj Gradec. It's easier to organise everything from the school. Hiking to the mountains and walking are really popular in Slovenia. This is not surprising because the nature here is wonderful. In our Carinthia region of Slovenia there are many mountains, interesting villages, historical sites, lakes … So, a lot to explore. In this scenario we focus on exploring the natural environment. It can be easily adapted to your location.

Materials & Technology

- Equipment suited for hiking (depending on the trail)
- Mobile phones or tablets for the hike
- Computers or laptops for follow-up activities in the classroom
- Projector (in class)

Before programme begins

Teachers of Biology, Geography, PE and IT agree on the time plan of the lessons before the hike. They should also agree about learning goals and cross-curricular connections. On the hike, all of the knowledge from those lessons will be implemented.

Activity 1: First steps at PE lesson

In real life we often use measuring tools to record our physical activities. We use apps on our phones and tables on our computers. The teacher will introduce some of the hiking apps and make sure that students are able to use a chosen one (e.g. Strava) for planning a trip to the mountains and then for navigating in the terrain. This step concludes with the installation of the app on students' mobiles (individually or one per a small group of 3 - 4 students) before the following lesson. The main lesson is an outdoor activity, preferably with some running exercise.

- Give students clear instructions on what they have to do first: their task is to measure the distance to a given location (e.g. a mountain peak, a place of interest on a trail, etc), the elevation gain and estimate time of getting there for the whole group.
- The goal should be set in a realistic way to ensure that the activity can be completed during the lesson (preferably 2 lessons in a row).
- Lead the hike or a run (depending on the physical fitness of the group) in a peloton to be able to monitor performance of all the students.
- When they reach the goal, the students compare the actual time taken by the hike/run with their initial estimates.
- Based on the results and their accuracy, they plan the hike/run back.
- When they reach the destination, they make the comparison again of the estimate and the real time.

- A discussion of the results in the whole group may encourage students to further experiment with the app on their own, running/hiking in nature and having fun with the digital support of the exercise.

Activity 2: Creating custom maps

The main task for this interdisciplinary lesson programme is to find and identify rare plants that are of particular interest for the region where the hikes are organised. But before the activities move to a biology class, the students have a specific lesson going deeper into digital maps, only previewed at the previous warm-up PE lesson. This is best done in connection with the Geography curriculum.

- Choose a digital map platform such as MapQuest, or a map specifically used by hikers like AllTrails. MapQuest, for example, provides turn-by-turn directions for hikers. This can be useful for teaching students about how to map and navigate in different types of terrain.
- The chosen platform should allow you to create custom maps and add markers, lines, and shapes to them. Present the following steps using your mobile device and a projector so that the students can follow the procedures on theirs.
- First, download a chosen digital map app on your device. Once you have downloaded and opened the app, you will be prompted to grant the app access to your location. Make sure to allow access so that the app can accurately show your location on the map.
- Decide on the area of which a custom map will be created. This could be a park, a neighbourhood, or any other area that provides enough space and interesting features. It can be an area well known by the students so that they can easily connect a real environment with its representation on the map.
- Create a new custom map on the platform of your choice and zoom in on the area that you have chosen. Use the platform's drawing tools to mark out the boundaries of the area clearly.
- Choose a particular point on the map and add markers indicating where it is exactly located. You should also add clues to the markers to help find the point in the real world.
- Share the map with the participants by sending it to them via email or just share a link. And then ask them to test the map by following the clues (this can be in a nearby park).
- As a result, the students should be able to create such custom maps themselves and use them for the following activities.

Activity 3: Biology lesson on rare plants

A Biology lesson on rare plants can be an exciting and engaging way to introduce students to the importance of biodiversity and conservation. Such a lesson will get added value if connected with a following hiking trip to a region where the students can find and identify rare plants themselves. This is a general outline of how you could structure the lesson:

- Begin by discussing the concept of biodiversity and why it is important to preserve rare and endangered plant species. You could also show pictures or videos of some rare plants to spark students' interest.
- Provide students with pictures or descriptions of several rare plants and ask them to identify which ones are native to their region. This can be a good opportunity to discuss the importance of preserving local ecosystems.
- Divide students into groups and assign each group a specific rare plant species to research. They should gather information on the plant's habitat, range, threats to its survival, and any conservation efforts that are currently underway. This task can also be done individually as homework.
- Each group or a selected number of students should present their findings to the class. Encourage students to be creative in how they present their information, such as creating PREZIs, videos, etc.
- Use the presentations as a springboard for a class discussion on planning a hiking trip to the natural environment where these plants can be found. The discussion should finish with a choice of such an area at a feasible distance from the school.
- Explain to the students that their search for the plants can be facilitated by an app like iNaturalist, Seek, or Plantsnap, which will allow them to take pictures of plants and identify them. They can choose one of them and download it on their mobiles before the trip.
- Remind them also that they will need a digital mapping app introduced at the Geography lesson for some of the activities on the hike.

Activity 4: Rare plant quest on a hike

This has to be planned properly so that the students will be able to find the plants on their trips. First, make sure that you know the ecosystem to be visited very well. The chosen plants should be accessible and visible, e.g. along the trail, on a clearing where the group can stop or in a grove through which they can walk. An app for plant identification can be of great help.

- Create a scavenger hunt list: create a list of the rare plants that the students need to find. You can also add some fun and educational challenges, like taking a picture of the plant, measuring its height, or describing its characteristics.

- Set the rules for the plant hunt, such as the time limit, the number of plants to find, and the penalty for breaking any rules.
- Make sure that when the students find a plant from the list they mark its location on their maps (cf. preparations in the Geography lesson) and think of clues that may direct others to its exact position.
- After the plant quest, organise a debrief session to discuss the rare plants that were found and the challenges faced during the hunt. Depending on the time available, this can be done either during a stop on the hike (e.g. in a mountain hut) or back in the classroom.
- To close this activity, give the students a challenge to compare different apps for plant identification with other available sources of information on the flora in your region (e.g. handbooks, atlases, Internet portals). The discussion should be facilitated with a view to making students active users of such tools. These are just two examples of useful apps:
- https://www.picturethisai.com/
- https://www.inaturalist.org/

Activity 5: creating rare plant quest maps

This activity can be done individually by the students for homework but it can also be an idea for an IT class, especially to go deeper into how custom maps work and how to use more advanced features of this technology. What follows is a scenario that we propose but obviously it can be adjusted depending on the particular aspects of the digital technology that link to the IT class curriculum:

- Divide the students in smaller groups and ensure that each has relevant resources for creating the quest maps (marked locations of plants, photos, clues, etc on their phones).
- In this lesson they will work on computers so the first task is to transfer the resources from their phones to the computer disks and select/order them.
- Ask the students to go to the map portal that they have previously learned and create a custom map of the area which they explored on the rare plant quest.
- They should make markers indicating the location of the particular plants and provide clues that should be followed to find them. The clues can be riddles, puzzles, or any other creative ideas that they can come up with. Make sure the clues are not too difficult or too easy and that the markers are placed in appropriate locations.
- When the maps are finished provide instructions on how to make the maps available via the chosen portal to other hikers. Ensure that the activity finishes with each group publishing at least one map, preferably with different plant quests.
- Ask students to share links to the maps with other hikers, using social media dedicated to the fields like hiking, ecology or environment science. You should also share the links with your teacher colleagues, including the biology teacher who led the previous activity. The resources can be useful for follow-up lessons and outdoor activities with other classes.

Learning outcomes: the students are able to:

- Conduct biological research on rare plants in the region where they live, including deskwork and fieldwork during an outdoor trip
- Use both paper and digital sources in this research
- Learn characteristics of particular plants and their place in the ecosystem
- Create customised maps of selected areas where the plants can be found
- Design digital rare plant quests and share them online to encourage other students to follow them
- Develop better geographical and ecological awareness of their regions

8. Kaštel Gorge - Poštarski dom, Carinthia, Slovenia

The trail is not hard and is suitable for everybody.The path takes you through Kaštel, which is the most picturesque gorge in Carinthia. Unspoiled nature, great forests, and pastures with cows and sheep will take you to the past. It is an 11 km route with around 400 m elevation gain that will take you around 2,5 hours.

We recommend that you do a circular path so that you finish at the starting point.

HOW TO GET THERE

Our hike begins in Podgorje, a picturesque village near Slovenj Gradec, at Balek Inn. The distance from Slovenj Gradec is about 5 km, around 10 min drive by car. There is no direct bus connection so for a school trip it is a good idea to hire a bus. There is

plenty of space for free parking so the bus can wait for the students if the group decides to do a circular path, as we recommend.

WHERE TO STAY

When you come to Slovenj Gradec, there are some possibilities where you can stay. For big groups, the Hotel Slovenj Gradec is a good option. A lot of sports teams stay here when they come to train in our excellent sports infrastructure.
http://www.hotelslovenjgradec.si/

For smaller groups (10-12 people) Vila Pohorje is the more intimate choice:
http://vilapohorje.si/

You can stay at one of the tourist farms. We recommend Farm Lešnik which is situated 5 km from the town centre. Experience Great home-cooked food, maybe you are for adventure and you would like to learn to cook Slovenian dishes or sleep in *kozolec*?
https://www.facebook.com/people/Ekolo%C5%A1ko-turisti%C4%8Dna-kmetija-Le%C5%A1nik/100054508207745/

Perhaps Hostel Slovenj Gradec is a good choice for you. It is a clean, new hostel with friendly staff. https://www.koroska.si/hostel-slovenj-gradec

INTERESTING SPOTS ON THE TRAIL

Kaštel Gorge. It is situated in the Pohorje hills, which are part of the Central Eastern Alps, and it is known for its stunning natural beauty. The gorge is approximately 100 metres deep and two km long, and it was carved by the water of the river Mislinja. Visitors to the gorge can explore its scenic walking paths, cross its wooden bridges, and admire its waterfalls and cascades. There is also a cave, called Pekel Cave, located in the gorge that visitors can explore. Kaštel Gorge is a popular destination for nature lovers, hikers, and photographers. The circular hiking path runs under the mighty treetops of the forests, passing by the pastures, meadows, and posts, set up for rest and refreshment. The path begins in the Suhi Dol settlement, ascends through the Kaštel gorge, passing the Plešivški Mlin mill house, and the remains of a manor and then descend to the starting point, passing the ruins of a household of the parents of the first designer of space flights: Herman Potočnik Noordung.

Poštarski dom is a mountain hut lying beside a pasture surrounded by woods where you can get food and drinks and relax before you go back to finish your trail. It is located near the village of Legen, on the southern slopes of Mount Pohorje and is a

popular destination for hikers, cyclists, and skiers. The mountain hut offers accommodation for overnight stays, including several dormitory rooms with bunk beds and private rooms for couples and families. The rooms are simple but comfortable, and they offer a cosy and rustic atmosphere. The hut also has a restaurant that serves traditional Slovenian dishes, and visitors can enjoy stunning views of the surrounding mountains from the outdoor terrace.

Mount Uršlja or Plešivec (1699 m) is the most eastern part of the Karavanke range that lies between Slovenj Gradec and Črna na Koroškem. Because of the great views, it is very popular with hikers. On the top, there is the church of St. Ursula, a small church located near the mountain hut Poštarski Dom pod Plešivcem. At an elevation of 1,360 metres, it is the highest-lying church in Slovenia. The church is named after Saint Ursula, a Christian martyr who is venerated as the patron saint of archers, students, and educators. The current church building was constructed in the 17th century and features a simple baroque style. The interior of the church is decorated with frescoes and altarpieces that depict scenes from the life of Saint Ursula. The church is open to visitors, and it is a popular spot for pilgrims and tourists alike. From the church, visitors can also enjoy stunning panoramic views of the surrounding area, including the nearby Peca Mountain and the Drava River valley.

WHAT TO SEE NEARBY

Mežica mine is located near the main road leading from Mežica to Črna na Koroškem. It used to be one of the last lead-zinc mines in Europe that was still operating at the end of the 20th century. In more than three hundred years of operation, it had a significant impact on life outside the mine in the entire area of Mežica Valley. After the mine production had been closed, its rich technical, cultural and natural heritage was opened for touristic, educational, research and study purposes. The mine museum offers crafts and entrepreneurship activities utilising the potential of historical knowledge, authentic mining equipment and facilities. On its 20th anniversary, the museum received an award for good cooperation with schools on various curricular and extracurricular activities, letting students explore the fields of mining, geology, ethnology, history, occupational safety and educational science. Tourists can choose different ways of visiting the mine: by train, bike or even kayak. The most popular way is a ride on a genuine mining train right to the heart of the mine. After a 15 minutes ride, tourists leave the train and follow a trail to find out more about the history of mining through numerous exhibited objects. Another option is to ride a bike on a 5 kilometres long underground path through the abandoned and mysterious mining tunnels. Finally, the most adventurous way of the mine explorations is by kayak. The visitors receive all the necessary protective equipment and special kayaks for two to three persons each. Following a guide, they paddle along a small underground river to reach spectacular lakes almost 700 m below the surface.

Timber rafting on the Drava River is a unique and exciting experience that can be a great idea for a school trip. It offers a chance for students to learn about the history of timber rafting and its importance in the region's economy and culture, as well as to enjoy the beautiful natural scenery of the Drava River valley. Timber rafting involves floating down the river on a large wooden raft made of logs, just as people did centuries ago when they transported timber downstream to markets. Today, the experience is more leisurely, with guides steering the raft and providing commentary about the history and ecology of the river and surrounding area. The timber rafting experience can be tailored to the interests and needs of school groups, with options for shorter or longer trips, educational activities and presentations, and even team-building exercises. Students can learn about the importance of sustainable forestry practices, the ecology of the river and its inhabitants, and the cultural heritage of the region. However, it's important to note that timber rafting is an outdoor activity that is subject to weather and river conditions, so it's best to check with the tour operator beforehand to ensure that it's safe and feasible for your group. It's also recommended to book in advance, especially during peak tourist season, to ensure availability.

A bike trip on Štrekna can be a great way to explore the beautiful countryside and natural scenery of Slovenia, and it can be a fantastic activity for a school group with more time. Štrekna is a river valley, known for its picturesque landscape and cycling trails. There are several cycling routes that traverse the Štrekna valley, ranging from easy and flat paths suitable for beginners to more challenging mountain trails for experienced riders. The routes offer breathtaking views of the surrounding mountains, forests, and meadows, and they can be combined with stops at local attractions such as museums, castles, and traditional villages. A bike trip on Štrekna can be tailored to the interests and abilities of the school group, with options for shorter or longer rides, guided tours, and educational activities along the way. It can also be a great opportunity for students to learn about the local culture and history, as well as to experience the natural environment firsthand. However, it's important to ensure that the school group is prepared for the physical demands of the bike trip, including proper equipment and clothing, hydration, and rest breaks. It's also recommended to book in advance and to work with a reputable tour operator who can provide support and guidance throughout the trip.

SOURCES USEFUL FOR A SCHOOL TRIP PLANNING

The Mežica lead and zinc mine

Timber rafting on Drava River

Štrekna bike path

LEARNING SCENARIO: HOW HIGH IS IT

Subjects: Math, Physics
Grade Level: 8 - 10 (14 - 16 years old)
Estimated time: Developed as a practical upgrade of regular school curriculum

The contents of the school curriculum can be learned and improved even outside the school. It is already customary to take students on excursions to larger cities, where we see sights, visit museums, see theatre performances, and attend some other events. It is also customary for the school to organise sports days in the form of hiking, skiing, and other sports. These sports days are usually only for physical activity and have no connection with the curriculum in other subjects. However, they are usually more affordable than excursions.

However, we can also pack the love of nature and movement and the improvement of school material in different subjects by doing part of the lessons in nature while moving. Of course, a lot of additional work and coordination is required if we want to implement such a project, but the results can be worth the effort. We prepare in class, do additional activities on the hike, and then finish the project at school. You can easily customise this item-by-item scenario and it is also useful for other hiking locations.

Materials & Technology

- Equipment suited for hiking (depending on the trail)
- Mobile phones or tablets
- PCs with Internet access, at least 1 for a small group (2 - 4 students)
- Projector (in class)

Before program begins

Teachers of Maths and Physics agree on the time plan of the lessons before the hike. They should also agree about learning goals and cross-curricular connections. On the hike, all of the knowledge from those lessons will be implemented.

Activity 1: Project introduction at Maths lesson

In real life, we often use measuring tools to record our physical activities. We use apps on our phones and tablets on our computers. In particular, we refer to digital tools on a hike whenever we want to calculate a distance to walk, an elevation to climb, a steepness of the trail or a height of a mountain peak. In this scenario we will progress to some of these tasks, but before we start measuring heights in nature the students will repeat and revise the following topics in a Maths lessons:

- Trigonometric functions: trigonometric functions are a fundamental concept in mathematics that relate angles to sides in a right triangle. They play a critical role in many fields, including science, engineering, and navigation. To consolidate their understanding of trigonometric functions, the students first revise the basic components of a right triangle, including the hypotenuse, adjacent side, and opposite side. From there, the three primary trigonometric

functions (sine, cosine, and tangent) can be grasped as ratios of these sides. Students then practise using these ratios to solve problems involving right triangles and angles.

- Solving triangles where three data points are given: they first have to identify the type of triangle (right or oblique) and the given information. For a right triangle, trigonometric ratios are used to find missing sides and angles. For an oblique triangle, the Law of Cosines and/or the Law of Sines are used. Students solve for the missing information and the teacher checks their work. When all missing information is found they draw a diagram to confirm the solution and present it in a clear and organised manner with all necessary information, including units of measurement.
- Angle functions in a right triangle: to work with angle functions in a right triangle, the students first revise the relationship between the angles and sides. The three primary angle functions in trigonometry are sine, cosine, and tangent. These functions are used to relate the measure of an acute angle to the ratio of two sides of a right triangle. The sine function relates the measure of an acute angle to the ratio of the length of the opposite side to the length of the hypotenuse. The cosine function relates the measure of an acute angle to the ratio of the length of the adjacent side to the length of the hypotenuse. The tangent function relates the measure of an acute angle to the ratio of the length of the opposite side to the length of the adjacent side. To use angle functions to solve a right triangle, students must identify which function to use based on the given information and what they are trying to solve for. Once they have identified the appropriate function, they use algebraic manipulation to solve for the unknown value.

Activity 2: Uniformly accelerated motion in measuring the height of objects

Uniformly accelerated motion can be used to measure the height of objects in nature, such as trees or cliffs, through a process called "falling object measurement". The process involves dropping an object from the top of the object being measured and measuring the time it takes for the object to fall to the ground. This topic is an excellent thematic for Physics lesson that can be followed by practical exercises on a hike. We propose to structure the lesson/s as follows:

- Introduction to the concept of uniformly accelerated motion, vertical and free throw: to introduce the concept of uniformly accelerated motion in vertical throw and free fall, the students have to first understand the basic principles of acceleration, velocity, and displacement. Uniformly accelerated motion refers to the motion of an object moving with a constant acceleration. In vertical throw, an object is projected upwards at a certain initial velocity and then falls back down due to gravity, while in free fall, an object is dropped from a height and falls due to gravity alone.

- Since the acceleration due to gravity is constant, the time it takes for the object to fall can be used to calculate the height of the object using the equations of uniformly accelerated motion. Specifically, the equation for the displacement of an object in free fall is h = (1/2)gt^2, where h represents the height of the object, g represents the acceleration due to gravity (9.8 m/s^2), and t represents the time it takes for the object to fall. By measuring the time it takes for the object to fall and plugging that value into the equation, the height of the object can be determined with a reasonable degree of accuracy. This method is commonly used by scientists and field researchers in forestry, ecology, and geology to estimate the height of tall objects in nature. However, it should be noted that this method is limited by factors such as air resistance and wind, which can affect the rate of falling of the object and thus the accuracy of the measurement.
- To better understand this topic, it is important for the students to review the equations of motion for uniformly accelerated motion, including the equations for displacement, velocity, and acceleration. Students should also review the concepts of time, height, and initial and final velocities in relation to these equations. It is important to note that the acceleration due to gravity is always constant, and can be considered as 9.8 m/s^2.
- Consolidation of the knowledge is best done through practice problems and exercises to reinforce understanding and improve problem-solving skills. Students should also be familiarised with the units of measurement used in this topic, including metres for displacement, metres per second for velocity, and metres per second squared for acceleration. At this stage all the practical tasks can be conducted at school (e.g. measuring at what height from the ground is the classroom window) before taking students on a hike to the mountains with the task of measuring the height of a rock or a tree.

Activity 3: Apps for determining the height of an object in nature

Digital apps have revolutionised the way we measure objects in nature. With the help of advanced camera technology and computer vision algorithms, it is now possible to accurately measure the size and dimensions of objects in the natural world, such as trees and rocks, using just a smartphone or tablet. These apps can provide a range of useful information, from estimating the age of a tree or the weight of an animal to calculating the distance between two objects or the height of a cliff. They are useful tools for scientists, researchers, and nature enthusiasts alike, allowing us to better understand and appreciate the natural world around us. Besides the methods introduced in the previous activities, they are also worth presenting to the students. An IT class/es is an ideal occasion to do it in the framework of this interdisciplinary scenario. We propose the following steps you can take to help the

students understand the potential of this technology and get the most out of the lesson.

- Introduce the concept of digital apps for measuring objects in nature: Start by explaining what digital apps are and how they work. You can also provide some examples of apps that are commonly used for measuring objects in nature, such as My Altitude, Clinometer or EasyMeasure depending on the level of the class
- Discuss the benefits of using digital apps for measuring objects in nature: Talk about the advantages of using digital apps for measuring objects in nature, such as their accuracy, convenience, and ability to capture data in real-time. You can also highlight how digital apps can be used for scientific research or to simply appreciate and better understand the natural world.
- Demonstrate how to use a chosen digital app for measuring objects in nature: Once you have introduced the concept of digital apps for measuring objects in nature, it's time to show students how to use one. You can demonstrate how to download and install an app, how to take a photo of an object, and how to use the app to measure its size or dimensions.
- Encourage students to practise using digital apps: After demonstrating how to use a digital app for measuring objects in nature, give students some time to practise using the app on their own. You can provide some objects for them to measure in the school environment or encourage them to find their own objects in nature to measure.
- Discuss the limitations of using digital apps for measuring objects in nature: While digital apps can be useful for this purpose, they do have limitations. It's important to discuss these limitations with students, such as the need for good lighting, the potential for errors in measurement, and the fact that not all objects may be measurable using digital apps.
- Encourage further exploration: Finally, encourage students to further explore digital apps for measuring objects in nature. You can provide some resources for them to use, such as online tutorials or recommended apps, or encourage them to come up with their own ideas for using digital apps in nature. This can help students to develop a deeper understanding and appreciation for the natural world, while also building their digital literacy skills.

Activity 4: Practical exercises on a hike

Measuring heights in nature will help students apply the knowledge they have acquired in the above Maths, Physics and IT lessons in practice. A hike to the mountains is an excellent occasion for such an activity, as it will allow students to measure both smaller objects (e.g. trees, rocks) or higher ones (e.g. cliffs). These are the steps we propose to follow when you get with the class to a suitable location on the trail:

- Divide the students into groups: each will choose an object to measure and determine the appropriate method. Encourage the use of different methods so that the knowledge of trigonometry, accelerated motion and measuring apps are used. A selection of an appropriate measuring method in relation to a chosen object may look as follows.
- Trigonometry: it can be an accurate method for measuring the height of a tree, but it requires some advanced Maths skills and the use of specialised tools such as a clinometer or a theodolite. With trigonometry, the students would need to measure the angle of elevation to the top of the tree from two different positions, such as the base and the midpoint of the tree, and use those measurements to calculate the height of the tree using the principles of trigonometry.
- Accelerated motion: it can let students measure the height of a cliff if they manage to drop an object from the top of the cliff and measure the time it takes for the object to fall to the ground. The height of the cliff can then be calculated using the principles of physics (using the formula: Height = (1/2) x g x t^2 where g is the acceleration due to gravity (approximately 9.8 m/s^2) and t is the time it took for the object to fall). Safety procedures have to be obeyed during the exercise (i.e. a suitable location at the top of the cliff where a student can safely drop the object; the area below the cliff must be clear of people that could be hit by the falling object). This exercise can provide a good approximation of the height of the cliff and can be a fun and engaging way to learn about physics and measurement.
- Smart Measure app: for measuring the height of a high rock with an app this is one of the best options. This app uses the camera and the accelerometer sensors on your smartphone to measure the distance and height of objects. The students should have installed the app on their smartphones in the IT lesson and now test it in practice, positioning themselves at the base of the rock and repeating the measuring process from different angles and locations to ensure accuracy and to get an average of the measurements.The accuracy of the measurement may depend on factors such as the distance from the rock, the quality of the camera, and the stability of the smartphone. It is also important to make sure that the smartphone is held level and steady during the measurement.
- At the end of the group sessions it would be interesting to compare the procedures and results, especially if the same object has been measured with different methods.

Learning outcomes: the students are able to:

- Use trigonometry to solve angles and measure heights of objects in nature
- Use uniformly accelerated motion to measure height of objects in nature
- Select and use appropriate apps for measuring heights of objects in nature
- Assess appropriateness of the given method for a particular task
- Compare the accuracy of results gained with these different methods

9. CŠOD Kavka - Kolovrat, Soča Valley, Slovenia

Our hike begins in CŠOD Kavka, which is the centre situated a little further from the hamlet Nebesa (Slovene name for Heaven) above Kobarid. The trail to Kolovrat is not hard and is suitable even for children. A lot of great views and an even more breathtaking outdoor museum at a half point of the walk is the reward enough for making some effort. The route is about 8 km long with an elevation gain of less than 300 m. Time required to complete the trail, with stops on the way, is around 3 hours.

https://strava.app.link/MScTZLn4stb

HOW TO GET THERE

The distance from Ljubljana to Nebesa is between 110 - 170 km depending on the road taken. The journey by car from the capital city would take about 2 - 3 hours.

When you get to the town of Tolmin, proceed toward Kobarid. When you come to the small village of Idrsko, turn left in the direction of Livek. From Livek to CŠOD is a 15-minute drive. You can park in front of the CŠOD Kavka.

There is no direct public transport so definitely for a school trip it is a good idea to hire a bus. The trail goes in a circle so the bus can wait for the students in the same parking place near the entrance on the trail.

WHERE TO STAY

The towns in the Soča Valley are some of the most famous tourist towns in Slovenia. Curious historians, admirers, explorers of nature, seekers of good taste, and lovers of various music genres will enjoy this location. Also school groups preferring to stay overnight in this region to extend the Kolovrat trip to some other interesting locations and activities will find plenty of accommodation options to choose from. Besides hotels and apartments, there are also less expensive offers. You can consult information on this portal dedicated to planning trips to the Soča Valley https://www.soca-valley.com/en/accommodation/accommodations

An example of such affordable accommodation for a school trip would be Hostel Soča Rocks in Bovec. It is a youth hostel, situated in the centre of Bovec, offering 68 beds in 6-bedded dorm rooms or double rooms. The bathrooms are shared; you can also use a fully-equipped kitchen and an outdoor barbecue. The combination of wood and lively wall colours adds to the pleasant atmosphere of the hostel.

As guests of the hostel, the students will get a discount on hiring sports equipment if you decide to organise some additional activities for which the Soča Valley is a great place: rafting, kayaking, hydrospeed, canyoning, zip line, zorbing or mountain biking.

INTERESTING SPOTS ON THE TRAIL

The Kavka Centre in Livške Ravne, where the hike starts, is a youth hostel and outdoor education centre, offering a range of programs and activities for young people. It is located in the heart of the Soča Valley and is surrounded by stunning natural scenery. The centre is another option for a school trip accommodation - the hostel has dormitory-style rooms, with shared bathrooms and a dining hall that serves traditional Slovenian cuisine, as well as vegetarian and other dietary options. The programs and activities at CŠOD Kavka focuses on outdoor education and adventure, and include activities such as hiking, rock climbing, kayaking, rafting, and mountain biking. The centre is located in a prime location for these activities, with numerous hiking trails and rivers nearby. In addition to outdoor activities, CŠOD Kavka also offers educational programs and workshops, covering topics such as history, culture, and environmental awareness. The centre is committed to promoting sustainability and environmental conservation, and has implemented a range of eco-friendly practices. The view of Venetian Slovenia and the Julian Alps has no limits. It is hard to believe that people fought hard battles on these peaks during World War I. The war marked these parts. There is a museum in the open on Mt. Kolovrat where you can visit caverns, hiding places, and foxholes of World War I.

Outdoor Museum Kolovrat. The circular path through the outdoor museum Kolovrat, also known as the Kolovrat Peace Park, is a historical site dedicated to the events that took place in this area during World War I, specifically the battles that occurred on Mount Kolovrat and in the Isonzo Front. The museum consists of a series of outdoor exhibits, including trenches, bunkers, and other military fortifications, which have been preserved and restored to their original state. In addition to the exhibits, the museum also features an information centre, where visitors can learn more about the history of the area and the events that took place during World War I. There is also a memorial site, which honours the soldiers who lost their lives during the battles on Mount Kolovrat. The path runs past command- and observation posts, machine guns, gun positions, caves, and networks of trenches and connection galleries at several levels. A visit to these positions is of special interest thanks to various details, such as, for example, spiral stairs in one of the caves, and also due to partly original materials which were used in wartime. The exhibits provide visitors with a glimpse into the harsh realities of war and the conditions that soldiers faced while fighting on the front lines. The museum is situated in a beautiful natural setting, surrounded by forests and mountains, and offers stunning views of the Soča Valley. It is a popular destination for history buffs and outdoor enthusiasts alike, offering a unique and educational experience for visitors of all ages.

Mount Kolovrat. Kuk with its 1243 m is the highest peak of Kolovrat, a mountain range from Livek to Kambreška. During World War I, the mountain was a strategic location in the front lines of the Italian-Austrian conflict, and was the site of several battles. Today, Mount Kolovrat is a popular destination for hikers and outdoor enthusiasts. There are several hiking trails that lead to the summit of the mountain, offering stunning views of the surrounding landscape. The trails vary in difficulty and length, so hikers of all levels can find a suitable route. One of the most popular trails is the Kolovrat Peace Trail described above. Another trail that leads to the summit of Mount Kolovrat is the Via Alpina, which is a long-distance hiking trail that spans across the entire Alps region. The Slovenian section of the trail passes through the Soča Valley and offers stunning views of the surrounding mountains and valleys. There are also several other hiking trails in the area that lead to nearby peaks and attractions, such as the nearby Krnica Valley and the Bovec ski resort. The hiking season in the region typically runs from late spring to early fall, although the trails can be snow-covered in the winter months.

NEARBY TOWNS AND WHAT TO SEE THERE

The Soča Valley is known for its natural beauty and outdoor activities. The emerald green Soča River, which runs through the valley, is a popular destination for activities such as rafting, kayaking, and fishing. The valley is also home to the Julian Alps, which offer numerous hiking trails and stunning views of the surrounding mountains.

In addition to its natural attractions, the Soča Valley has a rich history, with several World War I museums and memorials located in the area. The valley is a popular tourist destination, attracting visitors from around the world who come to enjoy its natural beauty and outdoor activities. In what follows we suggest some places worth visiting on a school trip to the region.

Bovec is a small town located in the heart of the Soča Valley. It is a popular tourist destination, especially for those seeking outdoor activities. Bovec is located near the Triglav National Park, which makes it a perfect starting point for hiking and mountaineering. In addition to its natural attractions, Bovec has a rich history, with several World War I memorials and museums located in the area. The town has a charming atmosphere, with narrow streets, traditional houses, and local restaurants serving delicious traditional cuisine.

Kobarid is another small town located in the upper part of the Soča Valley. One of the most famous attractions in Kobarid is the Kobarid Museum, which showcases the history of the Soča Front and the battles that took place in the area during World War I. The town is also a popular destination for outdoor enthusiasts, with numerous hiking and cycling trails in the surrounding mountains. Kobarid has a charming atmosphere, with traditional houses, local restaurants serving traditional cuisine, and a lively town centre. It is a popular tourist destination, attracting visitors from around the world who come to explore its rich history and natural beauty.

Tolmin is the biggest settlement and the management centre of the Soča Valley. Located in the middle part of the Soča Valley, it is known for its natural beauty and outdoor activities, with numerous hiking trails, waterfalls, and caves in the surrounding mountains. The nearby Tolmin Gorge is a popular destination for visitors, offering stunning views of the green Soča River and the surrounding cliffs. It is a popular destination for tourists looking to explore the beauty and history of the Soča Valley. The town also hosts several cultural events throughout the year, including the Tolmin Gorges Festival and the Overjam Reggae Festival. Each year it hosts a lively pulse of music, dance, and sports festivals. At the confluence of the Soča and Tolminka, fans of metal, rock, reggae, pop, alternative, and Oberkrainer music gather.

Kanal is a picturesque mediaeval town with a rich cultural heritage, located in the lower part of the Soča Valley, near the border with Italy. The nearby Sabotin Mountain offers panoramic views of the valley and the surrounding mountains. The town has a rich history, with several World War I memorials and museums located in the area. Visitors can explore the Kanal Museum, which showcases the town's history, culture, and traditions. The town has a charming atmosphere, with traditional houses, narrow streets, and local restaurants serving traditional cuisine. It is a perfect destination for those looking to experience the beauty and culture of the Soča Valley.

SOURCES USEFUL FOR A SCHOOL TRIP PLANNING

A guide to Soca Valley

Towns in the Soca Valley

Kobarid historic route

Kozjak Waterfall

Kobarid Museum

Cheesemaking Museum

LEARNING SCENARIO: Laminar and turbulent flows

Subjects: Math, Physics
Grade Level: 10 - 12 (16 - 18 years old)
Estimated time: Developed as a practical upgrade of regular school curriculum

The contents of the school curriculum can be learned and improved even outside the school. It is already customary to take students on excursions to larger cities, where we see sights, visit museums, see theatre performances, and attend some other events. It is also customary for the school to organise sports days in the form of hiking, skiing, and other sports. These sports days are usually only for physical activity and have no connection with the curriculum in other subjects. However, they are usually more affordable than excursions.

However, we can also pack the love of nature and movement and the improvement of school material in different subjects by doing part of the lessons in nature while moving. Of course, a lot of additional work and coordination is required if we want to implement such a project, but the results can be worth the effort. We prepare in class, do additional activities on the hike, and then finish the project at school. You can easily customise this item-by-item scenario and it is also useful for other hiking locations.

Materials & Technology

- Equipment suited for hiking (depending on the trail)
- Mobile phones or tablets
- Video camera
- PCs with Internet access, at least 1 for a small group (2 - 4 students)
- Projector (in class)

Before program begins

Teachers of Maths and Physics agree on the time plan of the lessons before the hike. They should also agree about learning goals and cross-curricular connections. On the hike, all of the knowledge from those lessons will be implemented.

Activity 1: Project introduction at Physics lesson

Before proceeding to the concepts of laminar and turbulent flows, students need to learn or repeat the Bernoulli equation and solve some problems on this topic. Also, it is important to introduce the Reynolds number which is a dimensionless quantity that is used in fluid mechanics to predict the behaviour of fluid flows. The lesson, or a set of lessons, if required, should explain the following topics:

- Bernoulli's equation is a fundamental principle in fluid mechanics that describes the relationship between the pressure, velocity, and elevation of a moving fluid.
  The equation states that in an ideal fluid (one that is incompressible, inviscid, and has no thermal gradient), the sum of the pressure energy, kinetic energy, and potential energy per unit mass is constant along a streamline. In other words, as the fluid flows from a region of high pressure to a region of low pressure, its speed increases and its potential energy decreases, but the total energy per unit mass remains constant.
  The equation can be expressed mathematically as P + 1/2 ρv^2 + ρgh = constant, where P is the pressure, ρ is the density of the fluid, v is the velocity, h is the elevation, and g is the acceleration due to gravity. Bernoulli's equation has important applications in many areas of engineering and physics, including fluid dynamics, aerodynamics, and hydraulics. It is used to model the behaviour of fluids in pipes, pumps, turbines, and other devices, and can be used to optimise their design and performance.
- Reynolds number is a dimensionless quantity that is used in fluid mechanics to predict the behaviour of fluid flow. It is named after Osborne Reynolds, who first proposed it in 1883. The Reynolds number is defined as the ratio of inertial forces to viscous forces and is given by the formula Re = rho * V * L / mu, where rho is the fluid density, V is the velocity of the fluid, L is a characteristic length scale, and mu is the fluid viscosity. The value of Reynolds number is important because it determines whether a fluid flow is laminar or turbulent. At low Reynolds numbers, the flow is laminar and smooth, while at high Reynolds numbers, the flow becomes turbulent and chaotic.
- By combining the Bernoulli equation with the concept of the Reynolds number, high school students can solve real-world problems and gain a deeper understanding of fluid mechanics. This knowledge can be applied to fields like engineering and hydrodynamics, providing a solid foundation for further exploration in the world of physics. An example task can be chosen in relation to the forthcoming hike: suppose there is a mountain river flowing steadily downhill with an average velocity of 2 m/s. The river has a width of 4 metres and a depth of 1 metre. We want to determine the pressure difference between the top and bottom surfaces of the river. The Bernoulli equation can be applied directly in this exercise.

Activity 2: Comparison of laminar and turbulent flows

This topic is an excellent thematic for Physics lesson that can be followed by practical exercises on a hike. We propose to structure the lesson/s as follows:

- Introduction to laminar and turbulent flows: laminar flow refers to the smooth, predictable movement of a fluid (liquid or gas) in a straight line. In this type of flow, the fluid particles move in parallel layers without crossing each other's paths. Laminar flow is characterised by low velocity and viscosity with high density. On the other hand, turbulent flow is chaotic and unpredictable, with the fluid particles moving in all directions. Turbulent flow is characterised by high velocity and viscosity, with low density. This type of flow occurs when the fluid is disturbed or when it moves too quickly through a restricted area. Examples of turbulent flow include water rapids, winds blowing over buildings, and blood flowing through arteries.
  In summary, laminar flow is smooth, while turbulent flow is rough and unpredictable. Both types of flows are important in different applications and have varying effects on heat transfer, mixing, and mass transport.
- Exemplification in the context the students will explore on the hike: in a mountain creek, water flow can be categorised as either laminar or turbulent. In a creek, laminar flow typically occurs in shallow areas and in slow-moving water, while turbulent flow occurs in deeper areas and in faster-moving water. The type of flow affects the velocity and transport of sediment and nutrients in the water, as well as the habitat for aquatic organisms. Understanding the different types of flow in a creek can help in managing and protecting its ecosystem.
- Creek’s ecology explored through examples of photos and videos of laminar and turbulent flow online: in a creek, small particles such as rocks, sand, and sediment are carried along by the water's current. These particles move in a variety of ways depending on the speed and force of the creek's flow. In slower parts of the creek, where the water isn't moving as quickly, particles may settle to the bottom and accumulate over time, creating a buildup of sediment. In faster-moving areas of the creek, such as rapids or waterfalls, particles can be churned up and thrown around, creating a turbulent and chaotic environment. As the creek flows downhill, it also erodes the surrounding banks and bedrock. This erosion can create new habitats for aquatic plants and animals, as well as change the course of the creek over time. Thus the movement of small particles in a creek is an important aspect of the creek's ecology and can have far-reaching effects on the surrounding ecosystem.

Activity 3: Observing and capturing images and videos of laminar and turbulent flows on a mountain hike

A hike to the mountains is an excellent occasion to observe both the laminar and turbulent flows. It is just a case of finding a stream or a creek and a good spot for a group observation. When observing small particles in a creek/stream, the students can notice and better understand the different types of flow in physics - laminar and turbulent.

- Laminar flow is when water moves in smooth, regular layers without any mixing between them. This occurs when the flow of water is slow and there are no obstacles or disruptions in the stream. When observing particles in laminar flow, we can see that they move in straight lines and maintain a constant speed. The particles will also remain parallel to each other and travel along the same path.
- Turbulent flow, on the other hand, is when water moves in an irregular pattern and the flow is disrupted by obstacles or changes in velocity. This can occur when the water is moving at high speeds or there are rocks or other objects in the stream. In turbulent flow, particles move in a more erratic fashion and can change direction quickly. The particles will also mix and disperse within the water.

- To capture images and videos of laminar and turbulent flow in a creek, first find a location with clear water and a steady stream. Divide the students into groups of two and let them observe how a laminar flow appears smooth and consistent, while turbulent flow shows irregular movements and swirling patterns.
- A camera with a fast shutter speed and high resolution will help to capture the details of the flow. The students can use a tripod or stable surface to keep the camera steady and take multiple shots from different angles. To enhance the clarity and contrast of the images, they should adjust the exposure and aperture settings as needed. With patience and attention to detail, they can capture stunning images of both laminar and turbulent flow in a creek.
- By observing the path of small particles in a creek, the students can gain a better understanding of these different types of flows and the physics behind them. Whether it's studying water movement for ecological research or simply for fun, observing the flow of water can be a fascinating and educational experience.

Activity 4: Processing the data collected in nature

Back at a physics lesson, or at an extracurricular workshop, the students are challenged with a task to determine the speed and direction of the currents from their videos of laminar and turbulent flows in a creek observed on the hike. For this purpose they will need to use a motion analysis program. Here is an outline of the learning scenario:

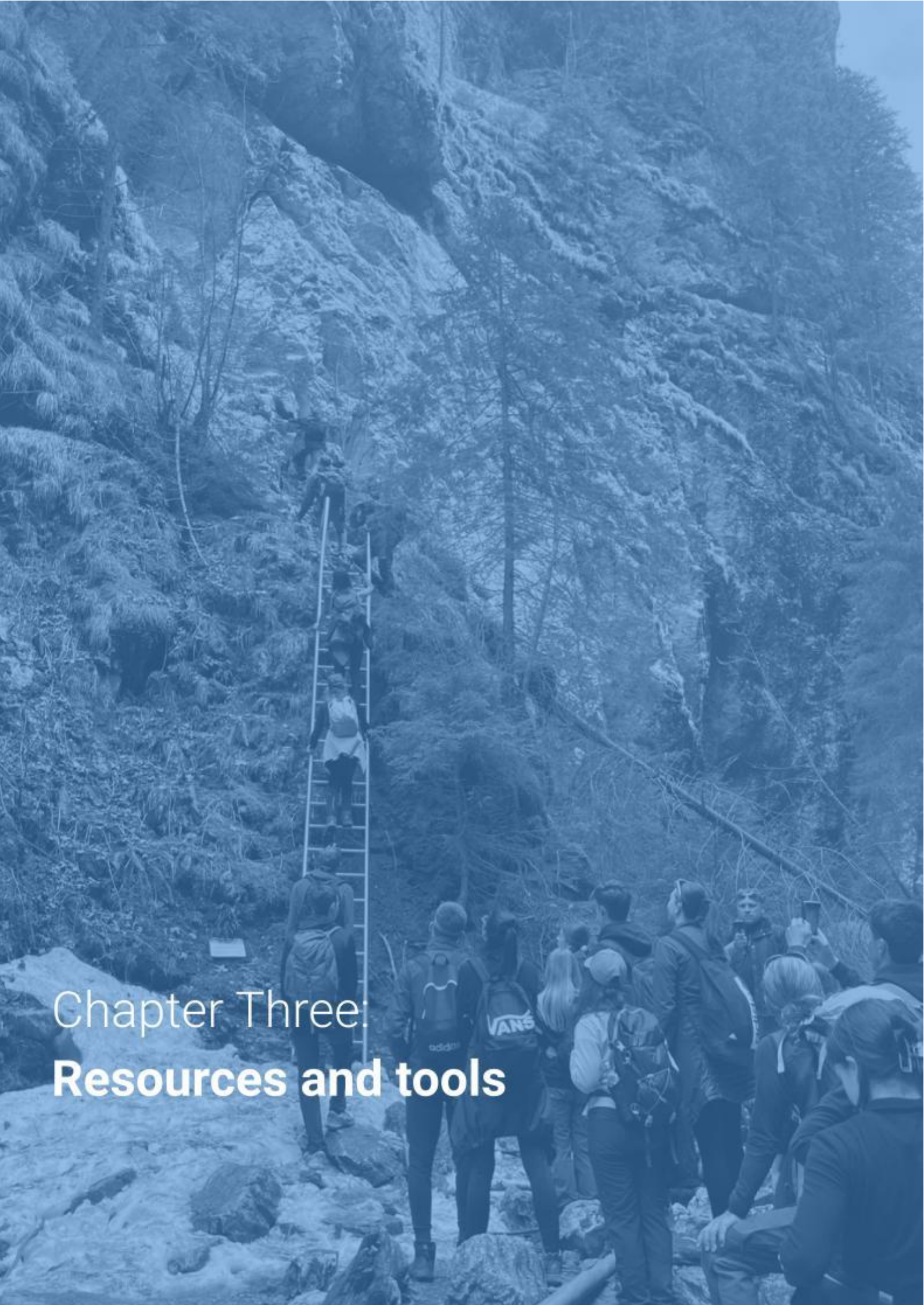
- Revise the concept of laminar and turbulent flows with the students, highlighting their characteristics and relevance in fluid dynamics. Discuss how the flow in a creek can exhibit both types of flow depending on various factors.
- Ask the students to present their videos or images of the creek/stream and select those which best depict the two types of flows.
- Instruct them to use motion analysis software or applications to analyse the videos and extract relevant data such as the displacement of specific points over time.
- Guide the students in using the motion analysis program effectively. Teach them how to track individual particles or markers in the videos, allowing them to measure their displacement and time intervals accurately.
- Instruct the students to calculate the velocities of the tracked points using the obtained displacement and time data. Emphasise the importance of considering units and scaling factors in the calculations. Have the students compare and contrast the velocities obtained from laminar and turbulent regions of the creek.

- Gather the results from each group and have a class discussion on the findings. Help students interpret the data and draw conclusions about the speed and direction of the current in the creek for both laminar and turbulent flows. Encourage them to relate their observations to the underlying principles of fluid dynamics and the factors influencing the flow regime.

By employing motion analysis programs in this scenario, students can engage in a hands-on exploration of laminar and turbulent flows while honing their skills in data analysis, interpretation, and applying physics principles to real-world situations.

Learning outcomes: the students are able to:

- Identify and differentiate between the two types of flows, laminar and turbulent
- Understand the factors that influence flow behaviour such as viscosity and flow rate
- Calculate and analyse flow parameters such as Reynolds number, flow velocity, pressure drop, and shear stress in both laminar and turbulent flow conditions
- Appreciate the practical applications of each type of flow in various fields such as engineering and physics



Chapter Three:
Resources and tools

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As we come to the final chapter of our publication on mountain hiking for school groups, we turn our attention to the resources and tools that can help educators plan and lead successful mountain hiking excursions. While hiking in the mountains can be a challenging and rewarding experience, it is important to have the right resources and tools at your disposal to ensure a safe and enjoyable trip for everyone involved.

In this chapter, we will list some of the most useful resources and tools for mountain school hiking, including safety resources. Note that this is just a small selection of the many online resources available for mountain school hiking. Educators should always exercise caution and carefully evaluate the sources of information they use to ensure their accuracy and reliability.

In the course of the HikeWays project we were exploring mountain trails with digital maps, drones and cameras so we also provide here links to relevant resources and tools facilitating such activities on the hike.

We believe that by using these resources and tools effectively, educators can help their students have a truly unforgettable and enriching experience in the mountains.

1. Safety in the mountains

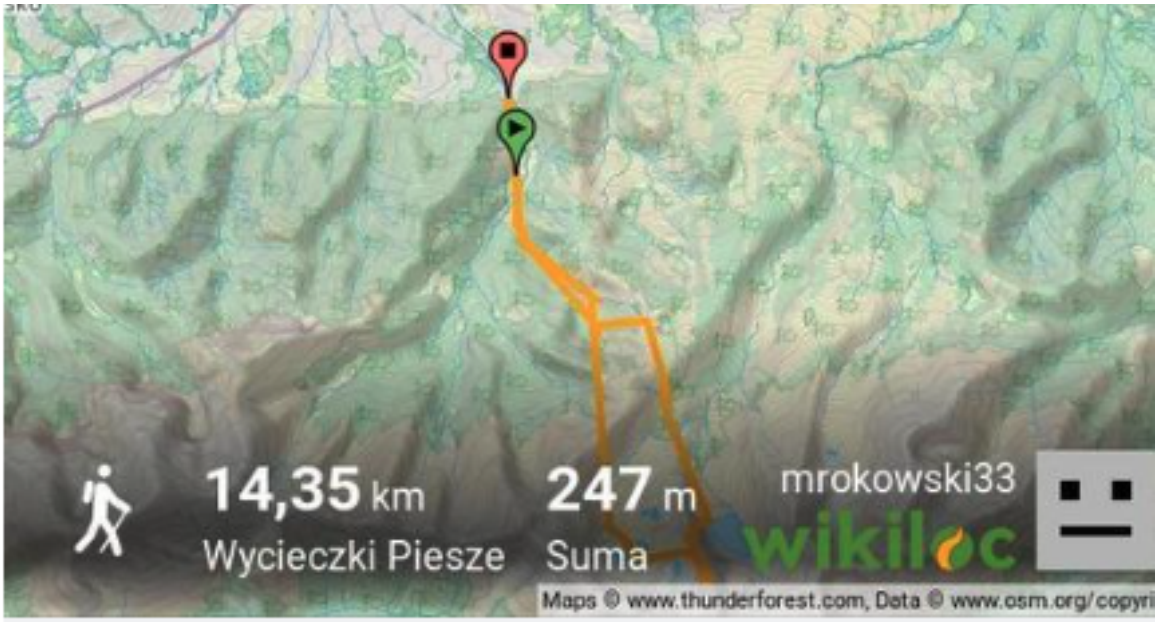
When embarking on hiking adventures with youth in the mountains, ensuring their safety becomes paramount. Proper preparation and knowledge of safety practices are essential to make the experience enjoyable and minimise potential risks. Fortunately, a wealth of resources is available to assist in this endeavour. Online platforms, such as hiking websites, blogs, and forums, offer valuable insights on mountain safety, providing tips on trail selection, equipment requirements, and emergency preparedness. Local outdoor organisations often offer safety workshops and courses tailored specifically for hiking with young people. Additionally, guidebooks and manuals dedicated to mountain safety can be invaluable resources, offering comprehensive information on wilderness first aid, navigation techniques, and weather awareness. It is thus worth doing preparatory research before venturing into the mountains with school students in order to ensure their safety. In what follows, we shortlist some of the resources consulted by us in the HikeWays project.

- European Hiking Federation
- International Mountain Guides Association
- International Commision for Alpine Rescue
- International Climbing and Mountaineering Association
- Mountain Rescue Service of Slovenia
- Mountain Rescue Service of Romania

- Mountain Rescue Service of Poland
- Great Outdoor Stack Exchange
- http://meteoblue.com
- https://www.windy.com
- European Avalanche Warning Services
- Avalanche Reports for the ALPS
- Snow reports for EU and UK
- https://www.outdooractive.com/en/

2. Digital maps

Digital maps provide a lot of benefits and conveniences, in addition to paper maps that we continue to use. With a digital map app on a smartphone or GPS device, hikers can access detailed and up-to-date trail maps, allowing for better route planning and navigation. These maps often include important information such as trail difficulty, elevation profiles, and points of interest. Digital maps also offer real-time GPS tracking, enabling hikers to stay on course and pinpoint their exact location, especially in remote areas where traditional paper maps may be limited. Furthermore, digital maps often incorporate user-generated content, such as trail reviews and photos, offering valuable insights and recommendations from fellow hikers. To sum up, digital maps provide a user-friendly and comprehensive tool for hikers in the mountains, enhancing safety and ensuring a more enjoyable and informed hiking experience. The following are the maps that we have used on the HikeWays, both students and teachers.



- AllTrails
- Wikiloc: Trails of the World
- Komoot – Cycling & Hiking Maps
- Hiking Slovakia - Tourist Map
- Mapy.Cz
- MapaTurystyczna.pl

3. Aerial photography

Aerial photography can greatly enhance the overall experience and educational value for young outdoor explorers. It offers a unique perspective that allows hikers to visualise the terrain, landmarks, and potential hazards from a bird's-eye view. By taking aerial images, hikers can gain a deeper understanding of the mountainous environment they are exploring. These visuals can help them grasp the scale and topography of the trails, enabling better preparation and route planning. Moreover, aerial photography can serve as a powerful educational tool, highlighting geological features, ecosystems, and environmental conservation efforts. It can inspire curiosity, foster a sense of wonder, and instil a deeper appreciation for the natural beauty of mountain landscapes. In the HikeWays project we have used drones on some of the trails (for national parks you need a special licence) and the following list has the purpose to facilitate preparation and organisation of such photography sessions with school students.

- EU-wide rules for safety of drones
- Gear for Aerial Photography
- Guide to the Top Drone Simulators on the Market for 2021
- Mastering DJI drone flying skills
- How to Fly a Drone: Beginner’s Guide
- How to Use Drones to do Stunning Aerial Photography
- The complete beginner's guide to drone photography
- Tips for Doing Drone Photography and How it Improve All Your Images
- Drone Photography: A Guide to Capturing Images Like A Professional
- The beginner’s guide to drone photography
- Tips For Getting Started With Drone Photography
- Drone Photography Tutorial: How to Take Killer Photos

4. Mountain filmmaking

In the context of school education, creating mountain videos can be a powerful and immersive medium to engage students and foster their creativity and learning. In the HikeWays project, the students used videos as a tool for visual storytelling. Also we experimented with video making on the hike as a way to foster foreign language learning (creating visual narratives from the trips with English subtitles). Below is a list of resources that provide valuable insights and guidance on why and how to make mountain videos, which may be of interest both to young hikers and their leaders.

- Getting Started with Adventure Filmmaking
- Techniques of Shooting and Editing an Outstanding Travel Film
- Simple Techniques for Shooting Better Travel Videos
- How to make a brilliant adventure travel film
- Seven Rules for Film and Video Editors
- Advanced Video Camera and Editing
- Make awesome video with 12 Best Travel vlogging tips
- Best Video Editing Software for Creators
- Best Video Editors for Slow Computers

- Editing with DaVinci Resolve? Pros vs Cons
- DaVinci Resolve 15.2 review
- Travel Filmmaking: Are You Doing It Right?
- Adventure filmmaking
- How to make an award-winning adventure film (without budget or crew)
- Techniques of Shooting and Editing an Outstanding Travel Film
- How to Make a Travel Video That People Actually Watch